ORBIT 11

Ideas
about Teaching
and Learning

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of the
Ontario Institute
for Studies
in Education

Free Distribution of Orbit to Ontario Schools

Starting with this issue, we shall be sending one free copy of *Orbit* to every publicly supported school in Ontario. We have adopted this new policy because we believe we have a responsibility to report to Ontario teachers on the activities of OISE and other research organizations. We hope that teachers to whom the journal is new will find it useful, and we urge that it be put in the staff room or in some other place where teachers can easily get hold of it. We also urge teachers to write to us about any new ideas they are trying out in the classroom and to make suggestions about the kind of information they would like the journal to feature. To date, lack of feedback has been our chief problem.

While our budget limits the free distribution of *Orbit* to one copy per school, the journal will continue to be available by subscription at the rate of $3 a year (five issues). We hope that many schools will renew their subscriptions or take additional ones to continue the practice they have already established of having a number of copies on hand.

Orbit will also continue to be available at the $3 annual subscription rate to individuals, to libraries and other organizations, to schools in other Canadian provinces, and to the schools and educational institutions in the United States, Great Britain, Europe, and other areas that make up a surprisingly large part of our subscription list.

Our regular readers will notice that the quality of paper used in *Orbit* has been considerably reduced with this issue. This is one of the economies we have introduced in order to stretch our budget over the free distribution to schools. We hope that no one will object too strongly. Indeed, we hope that this change will overcome criticisms made from time to time that the journal was too lavish.

Hugh Oliver
Editor

Vol. 3/No. 1/February 1972
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ORBIT 11

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Audience: *Orbit* is published by the Ontario Institute for Studies in Education for everybody involved in or concerned with education.

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Contributions: We should be glad to receive from readers articles about educational practice, criticisms of past issues of *Orbit*, and suggestions for future issues. Before submitting full-length articles, for which an honorarium will normally be paid, a preliminary letter should be sent to the editor.

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PATTERNS OF ENQUIRY IN SCIENCE EDUCATION

Menahem Finegold and
F. Michael Connelly

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We believe that a curriculum is effective if it fosters in people the outlook and habits of thought that encourage independent learning. This is the central aim of the Patterns of Enquiry Project at the Ontario Institute for Studies in Education, which seeks to humanize instruction in science through classroom discussion that centers on the more enduring aspects of science – i.e., on the nature of scientific enquiry and on how enquiry functions in establishing scientific knowledge.

The Project had its origins in workshops for science teachers that have been held at OISE since the summer of 1968. In these workshops, the teachers are provided with the conceptual framework and the skills useful in developing enquiry curriculum materials. They examine and discuss *Enquiry into Enquiry* (a teacher education film on the enquiry method of learning), study original research papers in science, writings on the history and philosophy of science, textbooks, case histories, biographies, enquiry-oriented films and film-loops, and selected science fiction stories. They also construct short units of discussion-based curriculum materials, which they are expected to use in their classes during the following school year. Most of the materials that have been developed in the Patterns of Enquiry Project originated as projects in these workshops. To date, the Project team has produced a film and users manual, four major discussion units (each divided into modules), one puzzle, and one game. In addition, preliminary work has begun on the use of science fiction literature. These experimental materials are currently being used in a variety of schools and are undergoing evaluation.

The following sections outline how the enquiry-centered approach to science teaching is exemplified by some of the materials developed so far.

Some Characteristics of an Enquiry Discussion as Exemplified by the Film 'Enquiry into Enquiry'

Recovery of meaning – Enquiry into Enquiry is a 23-minute, 16 mm color film for teachers, showing a class discussing Rutherford's paper 'The Collision of Alpha Particles with Light Atoms.' The aim of the class is to recover the meaning from Rutherford's enquiry. This process is guided by the teacher's questions concerning the structure of scientific reports – namely, questions on the problems being investigated, the data required and collected, the interpretation of the data, and the statement of outcomes. These basic questions are modified by the particular goals of the discussion and the stage it is at. *Structural* questions are primarily concerned with description (e.g., 'What is the problem?'); *functional* questions are primarily concerned with process (e.g., 'How do the terms of the problem determine the kind of data that will be evidential?'); *evaluative* questions are primarily concerned with the status of what is known (e.g., 'Given the discrepancy between the data required and obtained, how reliable are the results?').

The process of enquiry contributes something special to the student's understanding of curriculum content. Ordinarily, the meaning of a knowledge claim is transmitted or taught, by giving an account of what is known. Thus, a text might devote a chapter to a description of the four quantum numbers. Diagrams would be used to represent the conception of the atom involved in these numbers, and selected classroom demonstrations (often misnamed 'experiments') would relate the concepts to the physical world. Recovery of meaning adds to the meaning of an item of knowledge by relating the ideas (e.g., quantum numbers) to the *actual* data and theories that were used in developing the ideas. This adds a dimension to meaning that permits the student to assess the status of the ideas in terms of both their internal reliability and validity and of possible alternatives to the ideas.

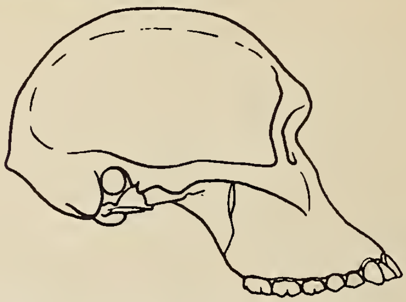
The teacher's role – The teacher has a special role in an enquiry discussion. He must first of all know in detail the passages under study. Second, and most important, he helps the students to build arguments that support their answers to his questions. The teacher does not say 'right' or 'wrong' nor does he answer the questions himself, unless of course he wishes to advance an argument on the same ground as the students. Rather, he says 'What is your evidence?' 'Your argument is clear but I don't see the connection with your stated position,' or words to that effect. The teacher's comments as discussion leader are restricted to considerations of the soundness and cogency of the students' arguments and not of their supposed correctness.

One question, multiple arguments – In the introduction to the film we hear: 'As you analyze our film discussion, consider the various relations among the problem, data, interpretation, and outcomes found in Rutherford's paper. A pattern, or rather patterns, of enquiry will emerge from this analysis. In the discussion process, students are encouraged to take positions about the pattern of enquiry. The structure of the resulting discussion has elements that parallel the elements in scientific enquiry. Our film discussion centers on the question of Rutherford's research problem. Students respond to the question with evidence derived from certain parts of the paper. They use the evidence to construct arguments leading to the formation of positions about the problem of the paper, and they compare and contrast the arguments for different positions. As is the case in scientific enquiry, there are often defensibly different positions in classroom discussion.'

It turns out that the students in the film advance three quite legitimate answers to the question posed. In other words, there is no single right answer to the question 'What is Rutherford's problem?'

Goals of the Discussion Materials as Exemplified by 'Hominid Evolution'

The unit 'Hominid Evolution' is designed to contribute to four important goals of science education. The first of the goals is a common one. The remaining three are rarely attempted in modern science curricula, although teachers are always concerned with them.



The skull of Australopithecus — a starting point for discussion about scientific evidence in the unit on Hominid Evolution

The teacher's edition of the unit on the role of paleontology in the formulation of theories on hominid evolution sets forth the goals as follows:

GOAL 1/ An understanding of the major theories, hominid types, excavation sites, and prominent researchers in the study of hominid evolution.
The content of this unit is similar to that found in most biology textbooks that have a section on the evolution of man. The works of men such as Leakey, Dart, and Broom are studied.

GOAL 2/ An understanding of the parts (e.g., problem, fact, interpretation) of patterns of enquiry and how these patterns contribute to the 'status' of knowledge claims.
A knowledge claim is simply what one claims to know about a field of enquiry. For instance, the unit presents Dart's claim that one of his fossil finds is a hominid child and that it represents a new, extinct hominid type, Australopithecus, or 'southern ape man.'

The 'status' of a knowledge claim relates to the reliability and validity of the claim. For instance, Dart's claim that his fossil is a new 'ape-man' is valid since, if he is correct, it establishes an important, intermediate ancestral type to man and clarifies considerably our understanding of man's evolution. However, while his claim is valid, it is unreliable. Broom, for instance, shows that many anthropologists have interpreted the fossil in other ways.

The 'status' of a knowledge claim involves such questions as: 'How is the claim related to the physical world?' 'What part of the world (e.g., of all the fossil fragments at a site) is accounted for by the claim?' 'What are the assumptions and simplifications in the enquiry that gave rise to the claim?' 'How tentative is the claim, and how much confidence can we have in it?' and 'What are the preconceptions, that is, the guiding ideas, governing the enquiry?' The answer to this last question can be found in one section of the unit, where it is shown that the various claims made about the place of the Neanderthals in man's family tree are very much influenced by prevailing beliefs in evolution.

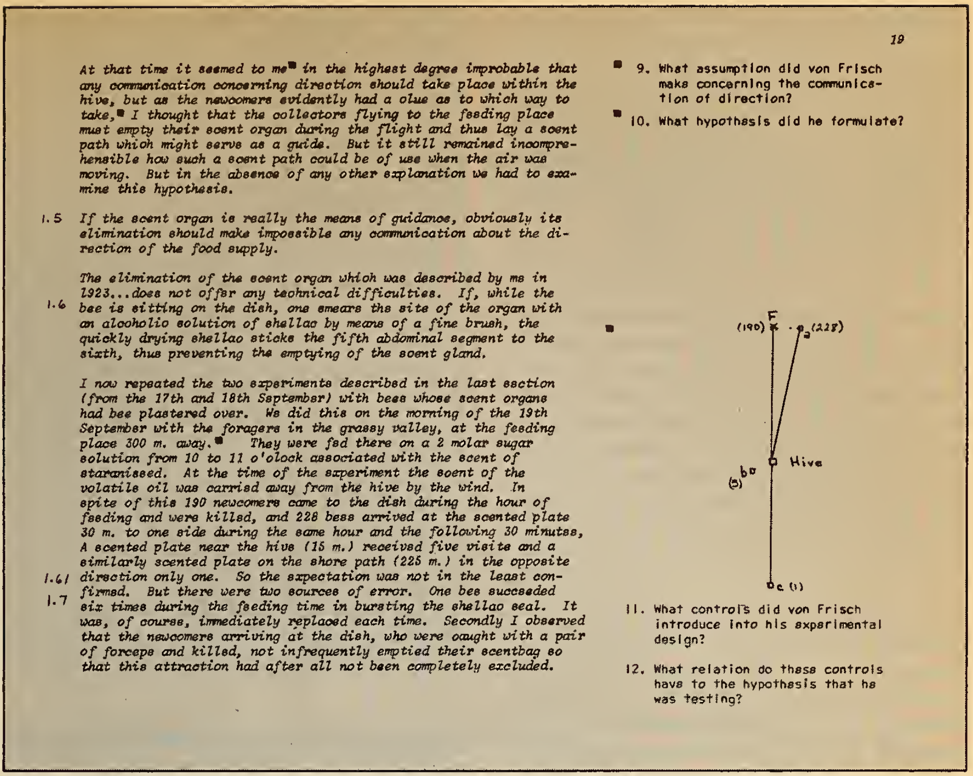
Provision for achieving the second goal in this unit is made by the extensive use of the original writings of anthropologists.

GOAL 3/ The reading skills and habits of mind that allow a student to recover the meaning of knowledge claims.
As these skills and habits develop, the student should become increasingly independent of the teacher and of the formal curriculum.

GOAL 4/ The evaluative skills and habits of mind that allow a student to assess the status of knowledge claims.
As these skills and habits develop, students should come to understand something of the nature of science and, thereby, be able to evaluate new scientific knowledge.

Guiding Conceptions in Enquiry as Exemplified by the 'Development of Optics'

One of the major reasons for asking questions of an original paper is to discover the researcher's underlying point of view about the subject. By determining in what terms the problem is framed, what kinds of data are needed, and the direction taken in an interpretation, it is possible to reconstruct the point of view. Schwab calls the point of view a 'principle of enquiry,' and in our units we refer to it as 'guiding conceptions' for enquiry. The following introduction to the student in the unit on optics very simply illustrates the notion of a guiding conception.


F
(190)
a (228)
Hive
b (5)
c (1)

19

At that time it seemed to me■ in the highest degree improbable that any communication concerning direction should take place within the hive, but as the newcomers evidently had a clue as to which way to take,■ I thought that the collectors flying to the feeding place must empty their scent organ during the flight and thus lay a scent path which might serve as a guide. But it still remained incomprehensible how such a scent path could be of use when the air was moving. But in the absence of any other explanation we had to examine this hypothesis.

■ 9. What assumption did von Frisch make concerning the communication of direction?

■ 10. What hypothesis did he formulate?

1.5 If the scent organ is really the means of guidance, obviously its elimination should make impossible any communication about the direction of the food supply.

The elimination of the scent organ which was described by me in 1923...does not offer any technical difficulties. If, while the 1.6 bee is sitting on the dish, one smears the site of the organ with an alcoholic solution of shellac by means of a fine brush, the quickly drying shellac sticks the fifth abdominal segment to the sixth, thus preventing the emptying of the scent gland. ■

I now repeated the two experiments described in the last section (from the 17th and 18th September) with bees whose scent organs had bee plastered over. We did this on the morning of the 19th September with the foragers in the grassy valley, at the feeding place 300 m. away.■ They were fed there on a 2 molar sugar solution from 10 to 11 o'clock associated with the scent of staraniseed. At the time of the experiment the scent of the volatile oil was carried away from the hive by the wind. In spite of this 190 newcomers came to the dish during the hour of feeding and were killed, and 228 bees arrived at the scented plate 30 m. to one side during the same hour and the following 30 minutes, A scented plate near the hive (15 m.) received five visits and a similarly scented plate on the shore path (225 m.) in the opposite 1.61 direction only one. So the expectation was not in the least confirmed. 1.7 But there were two sources of error. One bee succeeded six times during the feeding time in bursting the shellac seal. It was, of course, immediately replaced each time. Secondly I observed that the newcomers arriving at the dish, who were caught with a pair of forceps and killed, not infrequently emptied their scentbag so that this attraction had after all not been completely excluded.

11. What controls did von Frisch introduce into his experimental design?

12. What relation do these controls have to the hypothesis that he was testing?

Figure 1: Page from the student edition of the Unit on Honey Bee Communication

'Let us imagine that you want to explain the formation of shadows and that you want a deeper explanation than is given by merely saying that an object, say a building, blocks out the light. Let us assume that you are one of the first people to seek a solution to this problem and that there are no explanations available. How would you proceed towards an explanation? We suppose that you would, in some way, make assumptions about the best way to tackle the problem, that you would have to make certain observations on shadows, and that you would make some kind of interpretation of the observations in order to arrive at an explanation. Scientific enquiry involves all of these processes.

'Since there are a number of assumptions that might be made, there are different ways you could approach the problem. In the case of shadows, for example, you might "assume" that a knowledge of what light is and what it is composed of would help explain shadows. The explanation of the shadows would then be in terms of how the parts of light interact with objects, thereby giving rise to shadows. You could, for example, "assume" that light is composed of small particles. You would then consider what properties these particles have and what properties are involved in the interaction between them and opaque objects in giving rise to shadows.

'You might, however, begin by assuming that the nature of light is not an important factor in explaining shadows. Rather, you might "assume" that, whatever it is, light is something that travels in straight lines. Your explanation of shadows would now be quite different. What form would the explanation take? One approach would be to draw straight lines on paper and to make predictions about the size of shadows given the position of a light source and the height of an object. Now this seems to be a very common sense thing to do, but don't forget you are only supposing that light travels in straight lines; you are not saying that light does in fact travel this way. Furthermore, you are only supposing that what light is is not important to the construction of an explanation of shadow formation. You do not know for sure.

'How can you tell if you are on the right track? How will someone else know, once you have finished your enquiry, how much confidence to have in your approach? A common way of justifying an explanation is to show that something happens in reality that corresponds to your explanation. You might, for instance, investigate objects of different sizes and see whether objects of such and such a size form shadows of such and such a size when the position of a light source is so and so. Now, if you find that your prediction is, in fact, accurate, you will be more inclined to have confidence in your explanation.

'The way you have gone about seeking an answer in this case is an example of the use of a conception of light, invented by you to explain shadows. We call this sort of conception a "guiding conception" for enquiry. If you look closely at the example, you will see that the guiding conception has a number of components. First, there is the assumption you made about how light travels. You assumed that it was something that travels in straight lines. Second, in order to make your prediction about the size of the shadow, you represented the behavior of light by drawing straight lines on a piece of paper, thereby representing light behavior by means of a geometrical figure. Third, you predicted that a shadow of a certain size would actually form under certain conditions. In fact, you made a claim that given your assumptions something would happen under certain conditions. Finally, you will recall that the way this claim was checked was to see if the shadows you predicted actually occurred under the conditions you specified. If they did, then there was some reason to think that your answer was on the right track.

'What you have undertaken can be described as a Pattern of Equiry. Notice that it has the following components.
1) A guiding conception: Light travels in straight lines.
2) A problem for enquiry: Why do shadows form?
3) Data: Measurements of lines and angles.
4) Interpretation of data: Shadows form as you predicted they would.
5) A knowledge claim: The conception of light traveling in straight lines adequately explains why shadows form.'

Content and Method as Exemplified by 'Honey Bee Communication'

The major aims of these materials are achieved, as described earlier, through studying scientific method. However, since this is done in the context of an appropriate content, there is, in fact, no separation of content and method in the materials. For instance, there is no learning of a set of methodological 'steps,' nor is method relegated to a separate section or chapter in the materials. Furthermore, the study of methodological aspects, such as hypothesis formation, is achieved not through the use of formal definitions but rather through the exami-

Students at West Lane Secondary School in Niagara Falls study a hive used in conjunction with the Unit on Honey Bee Communication nation of actual hypotheses about actual scientific problems. Figure 1 shows a selection from the writings of von Frisch that is included in the unit on honey bee communication and illustrates this point.

Format of the Materials as Exemplified by the 'Development of Optics'

Each unit has a student and a teacher edition. The student edition is printed only on the right-hand page and is divided into two parts, the text and a part containing questions and explanations. The teacher's edition is the same as the student's, except that printed on the left-hand page is an analysis of enquiry and, where needed, answers to questions.

The right-hand page shown in figure 2 contains a selection from Ptolemy's investigation of refraction, followed by a partial analysis of his claims and a report on the continuation of his work. The question for discussion is *functional*, that is, it concerns the manner in which the problem determines the data obtained and how the problem prescribes, in advance, the interpretation.

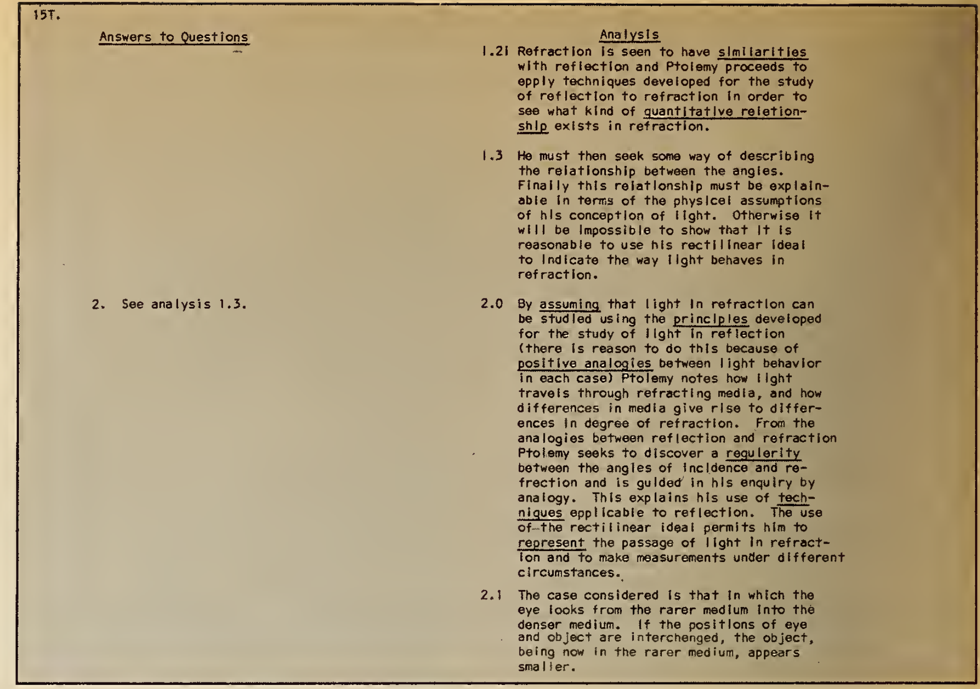
The left-hand page shown in figure 2 contains an analysis of part of Ptolemy's pattern of enquiry and indicates how this analysis can suggest directions in answering questions. As this selection shows, the analysis of enquiry offers the teacher a rich source of additional questions.

Some Possible Uses as Exemplified by 'Matter and Change'

This discussion unit constitutes about one semester's work. However, it is composed of a set of modules that are all relatively independent and can be fitted into existing curricula in various ways.

These few examples of how Matter and Change modules may be keyed to existing courses are taken from the teachers' edition.

Section	IPS	Chem Study	BSCS Blue
Alchemical conceptions of elemental matter	overview 6.8	2-3	
Boyle's corpuscular conception of matter	8.1 to 8.3	2-1, 2-2 Chap. 14	5-3 to 5-7
Boyle's experimental investigation of transmutation	2.8, 3.5, 4.1	Chap. 1	



15T.

Answers to Questions

2. See analysis 1.3.

Analysis

1.21 Refraction is seen to have similarities with reflection and Ptolemy proceeds to apply techniques developed for the study of reflection to refraction in order to see what kind of quantitative relationship exists in refraction.

1.3 He must then seek some way of describing the relationship between the angles. Finally this relationship must be explainable in terms of the physical assumptions of his conception of light. Otherwise it will be impossible to show that it is reasonable to use his rectilinear ideal to indicate the way light behaves in refraction.

2.0 By assuming that light in refraction can be studied using the principles developed for the study of light in reflection (there is reason to do this because of positive analogies between light behavior in each case) Ptolemy notes how light travels through refracting media, and how differences in media give rise to differences in degree of refraction. From the analogies between reflection and refraction Ptolemy seeks to discover a regularity between the angles of incidence and refraction and is guided in his enquiry by analogy. This explains his use of techniques applicable to reflection. The use of the rectilinear ideal permits him to represent the passage of light in refraction and to make measurements under different circumstances.

2.1 The case considered is that in which the eye looks from the rarer medium into the denser medium. If the positions of eye and object are interchanged, the object, being now in the rarer medium, appears smaller.

Evaluation of Materials

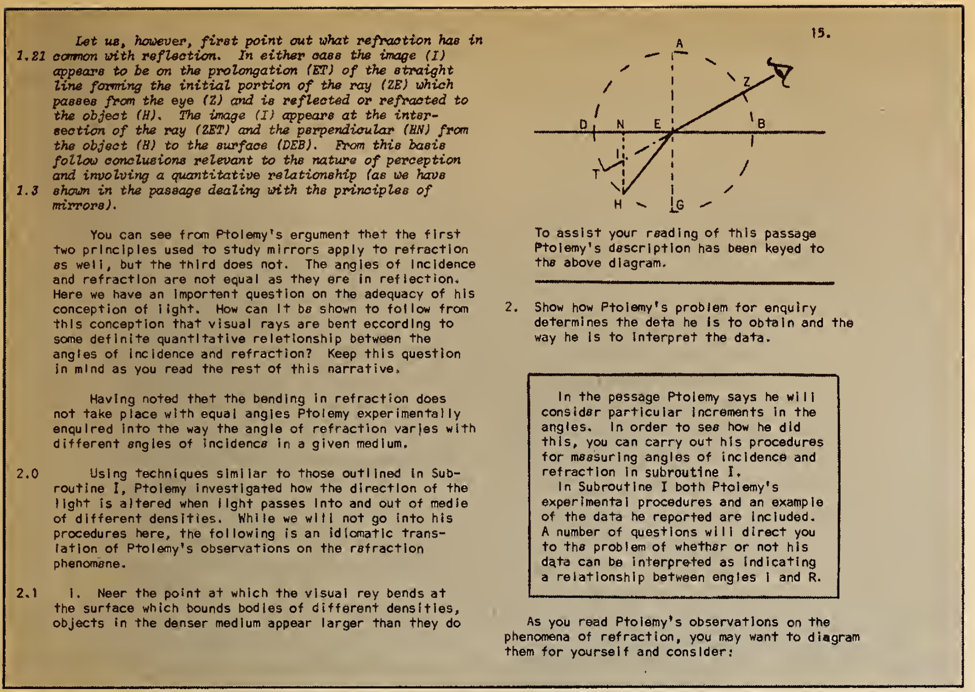
The materials are currently being tried out in three different ways.
1) As the basis of a year-long course. Bathurst Heights Secondary School, North York, has constructed a course titled 'Scientific Research Techniques: An Investigation of the Scientific Evidence for Human Evolution,' which uses the unit on hominid evolution and lasts a full year. The course was submitted to the Ontario Department of Education and was approved as an experimental course.
2) As a separate unit within an ongoing course. St. Joseph's Separate School, Etobicoke, is using the complete hominid evolution unit to replace portions of the BSCS blue version biology.
3) As individual modules in an ongoing course. The optics unit is being used with a grade 11 class of students in the Alternative and Independent Study Program (AISP), North York. Here, the instructional aim is more clearly concerned with the nature of science than in the other cases, where content goals are equally important.

A complete list of the materials at present available for use follows:

'Enquiry into Enquiry': A Film for Teacher Education
The film and a revised manual, based on our evaluation conducted this summer, is available for use by schools for professional development days, science council meetings, and the like.

An Enquiry into the Development of Optics
– Grades: 11-13.
– Time: Approximately 1 semester.
Content – Analyzes the development of conceptions of light, from Euclid's geometrical optics to Fresnel's wave theory. Based entirely on original works.
Theme – The logical development of, use of, and challenges to ideas about the nature of light.
Format – *Student edition:* Contains (1) original works edited for student use, (2) materials connecting the original works, (3) questions, (4) diagrams and exploratory materials aimed at giving an understanding of the original works, and (5) exercises.
Teacher edition: Contains (1) student edition, (2) an analysis in enquiry terms of the original works and, (3) answers to questions keyed to the students text. An introduction to the teachers guide provides suggestions for use of the unit.
Use – To extend existing textbook treatments of the subject or to be used in conjunction with texts as a one-semester course.

The Role of Paleontology in the Formulation of Theories of Hominid Evolution
– Grades: 9-13.
– Time: Approximately 1 semester.


A
Z
D
N
E
B
I
T
H
G

Let us, however, first point out what refraction has in
1.21 *common with reflection. In either case the image (I)*
appears to be on the prolongation (ET) of the straight
line forming the initial portion of the ray (ZE) which
passes from the eye (Z) and is reflected or refracted to
the object (H). The image (I) appears at the inter-
section of the ray (ZET) and the perpendicular (HN) from
the object (H) to the surface (DEB). From this basis
follow conclusions relevant to the nature of perception
and involving a quantitative relationship (as we have
1.3 *shown in the passage dealing with the principles of*
mirrors).

You can see from Ptolemy's argument that the first two principles used to study mirrors apply to refraction as well, but the third does not. The angles of incidence and refraction are not equal as they are in reflection. Here we have an important question on the adequacy of his conception of light. How can it be shown to follow from this conception that visual rays are bent according to some definite quantitative relationship between the angles of incidence and refraction? Keep this question in mind as you read the rest of this narrative.

Having noted that the bending in refraction does not take place with equal angles Ptolemy experimentally enquired into the way the angle of refraction varies with different angles of incidence in a given medium.

2.0 Using techniques similar to those outlined in Subroutine I, Ptolemy investigated how the direction of the light is altered when light passes into and out of media of different densities. While we will not go into his procedures here, the following is an idiomatic translation of Ptolemy's observations on the refraction phenomena.

2.1 1. Near the point at which the visual ray bends at the surface which bounds bodies of different densities, objects in the denser medium appear larger than they do

15.

To assist your reading of this passage Ptolemy's description has been keyed to the above diagram.

---

2. Show how Ptolemy's problem for enquiry determines the data he is to obtain and the way he is to interpret the data.

> In the passage Ptolemy says he will consider particular increments in the angles. In order to see how he did this, you can carry out his procedures for measuring angles of incidence and refraction in subroutine I.
>
> In Subroutine I both Ptolemy's experimental procedures and an example of the data he reported are included. A number of questions will direct you to the problem of whether or not his data can be interpreted as indicating a relationship between angles I and R.

As you read Ptolemy's observations on the phenomena of refraction, you may want to diagram them for yourself and consider:

Figure 2: Facing pages from the teacher edition of the Unit on Optics

Content – Covers major theories of, and fossil evidence for, hominid evolution, using the original works of Leakey, LeGros Clark, Coon, etc.
Theme – An exploration of the development of a diversity of competing theories of hominid evolution.
Format – One edition for student use. Contains (1) original materials, (2) translation of original materials for student use, (3) materials connecting the original documents and translations, (4) boxed comments and questions, and (5) exercises organized by a set of 'Invitations to Excavate.'
Use – To replace existing textbook treatment as a one-semester course.
Note:
This unit, under a different title, is now being used as an Ontario Department of Education experimentally approved course in one school.

Matter and Change: An Enquiry into Conceptions of Plant Nutrition
– Grades: 9-13.
– Time: Approximately 1 semester.
Content – Topics normally covered in intermediate science. Analyzes the development of our understanding of the structure of matter and the nature of change as it applies to plant nutrition, using the original works of Boyle, Newton, Priestley, etc.

Menahem Finegold, one of the authors of this article, discusses a concept from the Optics Unit with students from the Alternative and Independent Study Program in North York

Theme – Comparison of the development of different logical conceptions of the nutrition of plants.
Format – Same as 'Optics.'
Use – To be used as part of an intermediate general science program or in conjunction with regular course materials in biology and chemistry as a one-semester course.

Honey Bee Communication: An Enquiry into Two Conceptions of Animal Behavior
– Grades: 9-13.
– Time: Approximately 2 weeks (10 class periods).
Content – Aspects of animal behavior normally covered in high school biology. Analyzes conceptions of honey bee feeding behavior using the original works of Karl von Frisch, Wenner, and Johnson.
Theme – The development and use of two theories to account for bee feeding behavior.
Format – Same as 'Optics.'
Use – To be used in any high school biology course at intermediate or senior levels, or as a segment of a general science course.

Ordering the Chemical Elements: A Classification Puzzle
– Grades: 9-13.
– Time: 1 to 3 periods.
Content – A puzzle that poses a problem analogous to that faced by chemists in the nineteenth century attempting to produce a periodic table.
Theme – To provide students with an understanding of the classification process in science and to introduce them to the periodic table.

Students at William Lyon Mackenzie High School in North York attempting to work out the periodic table puzzle

Format – Over a hundred cards representing the chemical elements. Each card lists the name of the element, the name of the discoverer, and the date of discovery, and gives information about the properties of the element. Cards are called into play on the basis of the date that the elements were discovered – reasons as to why certain groups of elements were discovered at a certain time are discussed. When a sufficient number of cards have been called into play, groups of students attempt to organize them into a meaningful pattern, making use of the properties listed on the cards. The teacher is supplied with a guide.
Use – As part of any high school chemistry course.

Enquiry – A Game of Classification
– Grades: 9-13.
– Time: Approximately 1 double period.
Content – A game in which students detect scientific errors and are called upon to develop arguments to support their claims.
Theme – An understanding of the nature of scientific evidence.
Format – Students are supplied with scientific 'account' cards, a set of play and scoring rules, and a list of error categories. When different students classify the error of the scientific account in different ways, the game progresses to a discussion phase, followed by an argument phase.
Use – As part of any high school science course.

The Patterns of Enquiry Project is now engaged in introducing materials to schools. Principals and teachers who wish to see these materials or to use them in their schools are invited to write to:
Dr. F. Michael Connelly, Project Director,
or Menahem Finegold,
The Patterns of Enquiry Project,
Department of Curriculum,
The Ontario Institute for Studies in Education,
252 Bloor Street West,
Toronto 5, Ontario.

Information from educators who are themselves working on materials of a similar nature would also be welcome.

THE CANADA STUDIES FOUNDATION

George S. Tomkins,
Co-director of the Canada
Studies Foundation

It is now more than three years since the publication of *What Culture? What Heritage?*, a report that revealed the dismal state of affairs in our schools where the study of Canada is concerned. Concentrating mostly on the teaching of Canadian history and civics, this report was based on probably the most intensive investigation ever undertaken in this country of the teaching of any subject. The findings made it plain, to say the least, that neither students nor their teachers have been 'turned on' by what is happening, or not happening, in the Canadian studies classroom. The Hodgetts Report, as it has come to be known in honor of A. B. Hodgetts, the dedicated teacher who directed the study, became that *rara avis* in Canada, a best seller on the subject of education. Concern about Canadian studies suddenly began to take its place with politics, sex, and sports as a staple of cocktail party conversation.

The report continues to sell well, along with a flood of Canadiana that now flows from the presses and the other media with no signs of abating. Student demands, linked with concern about the Americanization of the universities, are beginning to result in a modest increase in Canadian content at the postsecondary level. At other levels the picture is less clear, although the observer has no difficulty in sensing a greater (if sporadic) attention to the study of Canada than existed before. But on the other hand more permissive curricula, reflected in recent changes in Ontario, for example, make it less rather than more likely that many secondary school students will be exposed to studies of their own country.

It was to improve the quality of such studies that the Canada Studies Foundation was incorporated early in 1970. A direct outgrowth of the Hodgetts Report, which recommended a nationwide network of Canadian studies centers, the Foundation has been chartered for a five-year period to improve existing approaches to teaching Canadian studies and to develop new ones. Established with the approval of the Council of Ministers of Education in the ten provinces, it assists in developing regional project teams of educators representing different levels and varying interests – classroom teachers, university professors representing different disciplines, experts in learning theory and practice, and administrators – and promotes their interregional cooperation.

The largest project sponsored by the Foundation brings together teams from the four western provinces in the development of curriculum materials and ideas around the theme of Canadian urbanization. Project Canada West, as it is called, is unique in the history of Canadian education. It is an enterprise in curriculum development that, utilizing the talents of teachers, pools people and resources from the four provinces involved to create new patterns of cooperation and communication among diverse groups. Each of the fourteen teams engaged in this project is working on a particular facet of urbanization and is developing materials and procedures that it is hoped will be of use to teachers across Canada.

At Brunskill Elementary School in Saskatoon, for example, teachers and pupils are investigating how identity is achieved in a modern urban society. Pupils are asked to consider the question, 'Who am I?' Through discussions and interviews with their classmates, they have begun to realize that everyone is unique in terms of cultural or ethnic background, family tradition, and origins. Through interviews with teachers and parents, they are encouraged to expand the concept of identity. Of equal importance, they acquire valuable social and inquiry skills. Through interviews with retired people in local senior citizens' homes, they have the opportunity to apply these skills. The lives of Saskatchewan's senior citizens span the history of the province, and in their interviews with them pupils have been led into such topics as the world wars and the Depression. They have also learned that in recent decades there has been a marked shift in the population from country to city, not only in Saskatchewan but elsewhere in Canada. Younger pupils are led to ask, 'Has Canada been in many wars?' Older pupils, viewing pictures of the Regina riots during the Depression, realize that social protest is not a phenomenon unique to the 1970s.

In Nanaimo, B.C., another Project Canada West team is developing a study of municipal government. Here senior secondary students, with the help of questionnaires designed by teachers and a U.B.C. political science specialist in urban government, are studying citizens' perception of the political process at the municipal level and their participation in it. This activity will lead to a consideration of urban political problems in relation to provincial and national policies. A simulation game is also being developed around the theme of Canadian urban government, with Nanaimo being used as a data base. As in the Brunskill project, teachers guides are planned to include accounts of the development procedures used and to provide examples of the questionnaires and other teaching aids. This will be of great help to schools elsewhere that are seeking to pursue similar themes.

In the Laurentian Project, teachers from Quebec City and Peterborough are developing materials on the theme of technology and its impact on Canadian society. Here, people from our largest provinces – from different cultural backgrounds and from the two main linguistic communities – are planning exchanges of materials and students as a means of testing out the various units of work created.

Of comparable interest is another project involving teachers and students from Toronto and Montreal, who are developing common approaches to the study of four periods in Canadian history: the 1760s, the 1830s, the 1860s, and the 1960s. For example, while French-speaking students in Montreal are studying the Confederation period through English-language sources (such as Toronto newspapers) and interpretations, Toronto students are studying French-language sources and interpretations. Some exchange of teachers and students has occurred, and (subject to financial limitations) it is hoped that this can be expanded.

The Canada Studies Foundation has encouraged the first cooperative endeavor between educators of Hull and Ottawa. In an attempt to bridge what the Royal Commission on Bilingualism and Biculturalism called 'the widest river in Canada,' English- and French-speaking educators from schools and universities in the region are developing studies around the theme 'Towards a Mutual Understanding,' based on both historical and contemporary considerations of what makes a citizen in the Canadian situation. Among the products envisaged is a kit on the national capital region that could be used elsewhere.

A group of teachers, writers, artists, and other academics from both linguistic communities in Quebec and Ontario are about to explore *l'idée de la nation* through an examination of Canadian literature and Canadian art, two of the most neglected areas of our curricula. Their aim is to create a multimedia open-ended kit, which will be developed and tested out in workshops with teachers and which, it is hoped, will find multiple uses in classrooms. The project is like most of the others in that it will not result in the creation of a highly structured curriculum package. Rather it is intended that what is produced will complement a great variety of Canadian studies curricula at various levels.

There are two small projects that are more highly structured and discipline-oriented. The Geography of Canada Project, developed by the Canadian Association of Geographers, aims to create a series of monographs focusing on specific topics; these again could be integrated with many curricula to inject a geographic perspective into history and social studies. Each monograph will include an interpretive essay on the topic, in nontechnical language, by an academic specialist. This will be followed by a teachers guide that will suggest sources and practical ideas for translating the topic into classroom terms. In the area of history, Dr. John Saywell of York University is developing several multimedia kits on historical topics pertaining to the seventy-five years before World War I.

A project presently under development in the Atlantic Provinces emphasizes the theme of regionalism and cultural diversity. As with the one in Western Canada, teachers and others from all the provinces concerned are brought together.

Many of the teams are field-testing their materials at present, and one project is close to publication – the work of a Winnipeg team of Indians and Métis concerned with the experience of native peoples moving into an urban environment. This material will be available commercially across Canada. In fact, we anticipate that Foundation material generally – both print and non-print – will have national distribution, although in some cases local or provincewide dissemination may be decided to be more appropriate. We are also considering the possibility of producing kits or 'files' of the best material on various themes that emerges from the projects. And thought is being given to establishing a yearbook and a journal for teachers of Canadian studies. (Persons interested in keeping informed of the progress of projects and the availability of materials produced are invited to write to the Foundation at 252 Bloor Street W., Toronto 5, Ontario.)

Implicit in all the work of the Foundation is the radical notion of the teacher as a curriculum developer. In the highly centralized provincial courses of study of the past, the curriculum was literally handed to the teacher – although, to be sure, imaginative and innovative teachers have always interpreted curricula in their own way once the classroom door was shut. In the typical American curriculum projects of the 1960s, development was largely in the hands of academic experts, who sometimes set out to create what they quite frankly called 'teacher-proof' packages. It is now apparent that this approach has limited impact in changing what happens in classrooms. Moreover, with decentralization of curricula now in vogue in most provinces, the teacher is more and more becoming the central figure in curriculum planning. But at the same time, his new role means that new training is required and necessary expertise must be provided. In Canada Studies Foundation projects, this is accomplished by workshops and conferences, together with built-in provision for academic and curriculum consultation. Time, that precious commodity never available to teachers in sufficient quantity, is provided through funds that pay for release time, the hiring of substitutes, and honoraria for summer workshop activities. Thus we can establish new patterns of organization that will permit teachers and others to do curriculum work in Canadian studies on an ongoing basis.

Grade 1 children at Powell River, B.C., discussing 'my father's work' — one of the activities of the Foundation's Canada West Project

About 80 percent of all funds are at present being spent at the project level. The Foundation secretariat has been kept deliberately small (four persons in 1971/72) in accordance with the general philosophy of avoiding a central bureaucracy and encouraging work in the field. Funds to date have been acquired from private (individual and corporate) sources, and the Foundation is free of any political obligations or control. A total budget of about $3,750,000 is projected over a five-year period.

Experience to date suggests that when teachers are given recognition and resources, curriculum work of high quality will result. Already a network of committed teachers is growing up across Canada. It is hoped that out of this network, and out of the materials developed and experience acquired, there will grow long-range plans for continuing Canadian studies programs that will be taken up by provincial departments of education and local jurisdictions alike.

It will be noted that the projects described cover a wide range of broad concerns in Canadian society: urbanization, technology, multiculturalism and cultural diversity, and regionalism, to name the most noteworthy. These have been selected in accordance with the principle of 'continuing Canadian concerns,' the prime organizing focus of the Foundation's work. 'Continuing' implies the necessary historical perspective if students are to understand the significance of contemporary issues in Canadian life. 'Concerns' implies an interest in those questions that are relevant to the needs and welfare of all or most Canadians because they have significance for the quality of our civic life. As *What Culture? What Heritage?* revealed, teaching about Canada in our schools does little to reduce the divisive influences in our society. It does not counterbalance the regionalism of Canada – regionalism that is both inevitable and desirable – by giving students an adequate understanding of their total Canadian environment. By developing teaching materials and methods that will reflect the nature of Canadian society in all its diversity and avoid the 'bland consensus' view noted in the Hodgetts Report, the Foundation hopes to convey such a better understanding. It is by building into the curricula, the regional, ethnic, and other group differences and similarities of viewpoint relative to any 'continuing Canadian concern' that teachers and students in any region of Canada will come to appreciate the attitudes and values of their counterparts in other regions. Through projects such as those described here and through the developing network of communications among the project teams, the Foundation can contribute to nationwide perspectives for the conduct of Canadian studies programs in the future.

LET'S MAKE AN OPERA

An account of a 'happening'
with 120 children
between six and eleven

Margaret C. Galloway,
St. George's School, Toronto

'Why don't *we* make an opera?' An ambitious proposal for children eleven and under, perhaps, but in the view of its sponsors at St. George's School, a simple matter of routine. The source of inspiration was a Christmas performance of Benjamin Britten's *Let's Make an Opera* by the University Opera School. Our whole school and many parents attended, and the children amply repaid our efforts to make them a knowledgeable and appreciative audience.

In preparation for our visit, we first staged a production of *Let's Make an Opera* on our own. Staff members took the adult parts, some twenty pupils the children's parts, and everyone learned the audience parts. Although our efforts did not result in an outstanding production, they enabled the children to view the Opera School's performance with critical appreciation. No doubt they played a part too in the children's determination to make an opera themselves. But let us look briefly at the school and at the music program through which all this came about.

St. George's is a laboratory school attached to the University of Toronto's Institute of Child Study. Its pupils range in age from three to eleven-plus and are of normal intelligence. Each fall, the opening of school brings a new group of twenty beginners, aged three years. An intermingling of age groups begins when the children reach age six, and the arrangement of pupils in grades 3, 4, 5, and 6 is determined by compatibility rather than age. The musical education of the six- to eleven-year-olds is my responsibility.

The timetable provides an average of seventy minutes a week for music. Usually I teach the children in groups of ten to fifteen, although sometimes I work with twenty at a time. In addition to the regular program, children nine and over may take group guitar lessons one afternoon a week. Our work area is a low ceilinged, semi-basement room recently furnished with wall-to-wall carpeting to correct accoustic problems. Our equipment includes:

One average-quality upright piano (on the whole little used except for sound effects)

Orff Studio 49 instruments
four glockenspiels (two soprano, two alto)
two metallophones (one soprano, one alto)
four xylophones (two soprano, one alto, one bass)
one four-string bass viol

E.M.I. instruments
(see *Note* at end of article)
Strings
one octave psaltery
two octave zithers
one two-octave zither
one pentatonic zither
one chordal dulcimer

one nordic lyre
three bowed psalteries
Pipes
soprano, alto, and tenor

A large variety of percussion instruments acquired from all countries, as well as improvised materials and instruments constructed by the children

One tape recorder

One record player and a very limited selection of records

Guitars

There are three aspects to our music program: making up original music (creative work that includes musical composition and musical improvisation); reading and playing or singing written music; learning about music and listening.

In 'musical composition,' the children think out and write down music either before or after playing it. 'Musical improvisation' is more spontaneous. The children make up music on an instrument. Sometimes it is free expression – often too long to be remembered and repeated – but when it is repeated and polished it becomes 'prepared improvisation.'

Some of the music reading is, of course, from printed texts. Most of it, however, is in the form of orchestral parts that I prepare on 6″ x 8″ cards in music notation sized to suit the age group concerned. The selections range in difficulty and complexity – from Frère Jacques and Beatle and 'mod' songs to arrangements of Purcell and Bach. In all the music I prepare for the children, I use Italian terms, musical signs, and orchestral devices as required. Sets of orchestral parts are kept in envelopes marked with colored spots to indicate the degree of difficulty – one spot for the easiest, six for the most difficult. The children choose their own envelope and select from it a part they feel competent to play. Having chosen their part, they practice reading the notes to themselves, fingering the notes on the instrument, and playing the part through alone. Players are added one by one, and when the piece fits together as a whole, we tape it for detailed study, self-criticism, and improvement.

The third aspect of our program, learning about music and listening, includes musical games, puzzles, programmed learning, films, and visits to the museum, the music library, and concerts. Each child is responsible for keeping up to date a file card with three headings: 'What I know in music theory,' 'Music I can play,' and 'My musical activities this year.'

Most of the creative music our children produce stems from their classwork, field trips, and group or individual interests. Among the most memorable selections are:

music for shadowgraphs (improvised by the manipulators and taped for use at their performance)

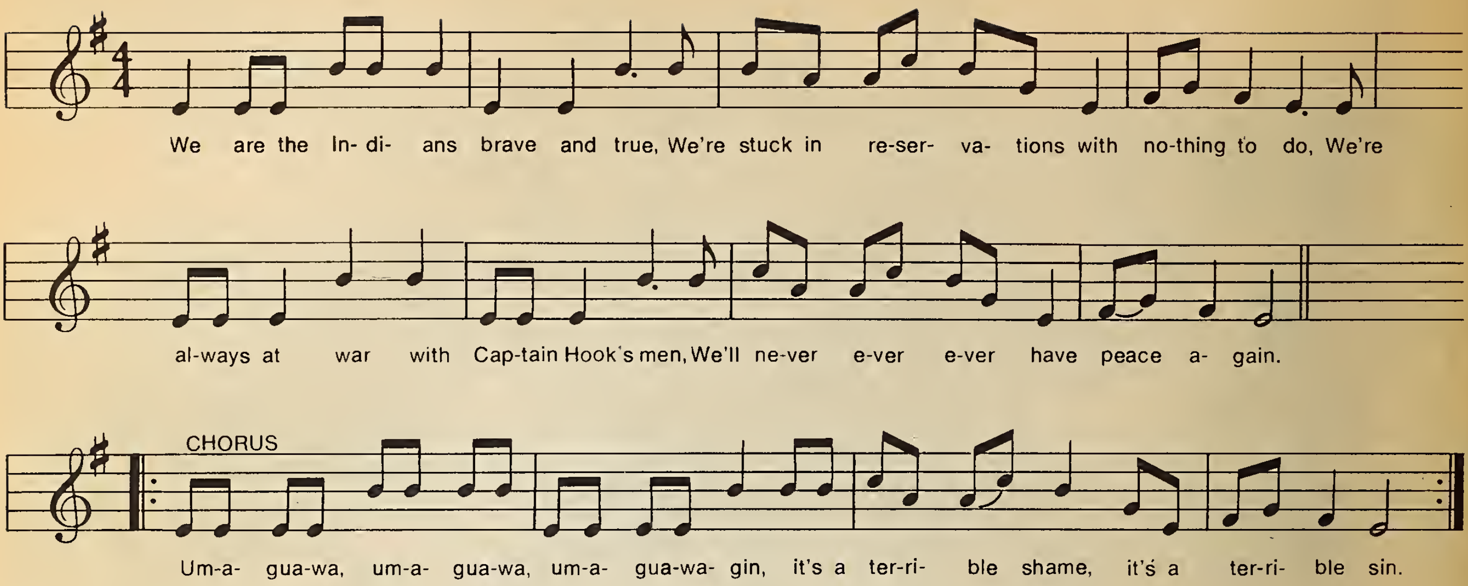
music improvised to projected transparencies of photomicrography (photographs through a microscope, mainly of crystal formations)

music for slides illustrating geological features

music for films made by the children, some of outstanding quality

music for plays, puppet shows, spontaneous drama and movement.
Much of this music is taped from live improvisation.

My observations of children have made me aware of a pattern of development that generally seems to hold true. Three- and four-year-olds play a simple instrument with the same freedom and abandon they display in using a brush or crayon. Up to the age of five or six they are fascinated with the instrument itself. Sometimes they let it 'tell a story,' accompanying their own narrative with plucked and stroked sounds on a psaltery; sometimes they explore it for different sounds, experimenting with ways of making it speak. This is the age when children will pluck all the strings on a zither and then try the short wires beyond the bridge – the non-notes –


We are the In-di-ans brave and true, We're stuck in re-ser-va-tions with no-thing to do, We're
al-ways at war with Cap-tain Hook's men, We'll ne-ver e-ver e-ver have peace a-gain.
CHORUS
Um-a-gua-wa, um-a-gua-wa, um-a-gua-wa-gin, it's a ter-ri-ble shame, it's a ter-ri-ble sin.

The Indian Women's Song from the St. George's School opera based on the story of Peter Pan

which for them are interesting discoveries. At this time, they can learn many simple playing techniques – hitting, plucking, stroking, using a bow, blowing a single note on a pipe.

By the age of seven or so, children can express experiences through instruments and song. I asked some six- and seven-year-olds to travel by magic carpet to any place they wished, to do there whatever they chose, and then to find a suitable instrument and tell us what it was like. The response was most interesting. Three boys played 'going in a submarine deep into the ocean.' With a small drum, a rattle, and a melody instrument, they made music that suggested the rhythmic throb of the engine and the eeriness of probing the unknown. A boy who chose to 'climb a mountain' described his experience by playing every note up a chromatic scale of two octaves on a bowed psaltery he had never handled before. This is the age at which group improvisation is most rewarding. I have recordings of children reading their original stories, with an 'overture' improvised without rehearsal by a volunteer group and interludes played spontaneously at suitable pauses in the reading. The music is breathtaking – possessed of the qualities that distinguish children's art: vigor, balance, and a sense of rightness. This sort of music-making is a deep experience for the child and awakens in him an appreciation of the compositions of others.

Children of eight and nine are at a learning peak and enjoy incorporating newly acquired knowledge into their own expression. They may improvise a 'minuet like Mozart's' for their puppets after listening the week before to 'Eine Kleine Nachtmusik.' They can evoke a strong response in their listeners through mood music and can compose music – even of an abstract quality – for the plays and films they create.

Ten- and eleven-year-olds have developed critical standards that lead them to compose quite consciously, with form and balance and nearly always with good taste. By this age, individual characteristics begin to show. In one of my classes, a serious eleven-year-old boy introduced a piece of group improvisation. 'This is a medieval battle. The foot soldiers and cavalry prepare before dawn. After the battle just about everybody is dead.' A group of twelve boys responded, improvising music that was sensitively beautiful. Agonizing loneliness characterized the last episode, 'Counting the Dead' – an exquisite piece of two-part counterpoint that a seasoned composer might be proud to claim.

And now, having discussed our program and the range of abilities our young musicians brought to their task, we come to the 'opera' itself. The children's suggestion that we 'make an opera' was considered by the two oldest groups and approved. After much deliberation, they narrowed the choice of subject to two stories – *Alice in Wonderland* and *Peter Pan.* All the children in the school had a voice in the final decision, and their choice was *Peter Pan.*

Enthusiasm ran high as preparations began. Children in the higher grades wrote the script, arranged acts and scenes, copied parts, and prepared scenery and properties. The seven-, eight-, and nine-year-olds in grades 3 and 4 composed the musical score and provided the choir and orchestra. Some seven-year-old boys agreed to look after scene changes, and the eleven-year-olds accepted responsibility for the lighting.

Casting presented few problems. A Wendy asked to be Wendy Darling, a Michael volunteered to be Michael. The captain of the hockey team chose the role of Captain Hook and showed extraordinary talent. A very small nine-year-old, who was always miserable about her size, volunteered to be Tinker Bell. The rest of the older children were Indians, Pirates, and Lost Boys, and the younger ones were fairies, elves, and Indian children. Everyone from grade 1 to grade 6 was included, and for the performances all were in costume except the children looking after the lighting and changing the scenes. Since we do not have an auditorium, our production was theater-in-the-round performed in the dining room, which was filled to overflowing with a hundred and twenty child actors playing to audiences of parents seated around the walls.

Photographs: Marjorie Buchanan

The opera opened with an overture containing most of the children's major compositions. Each scene was preceded by an interlude designed to create the mood for what followed. Our performance, if not polished, was enthusiastic and uninhibited. Our Lost Boys – a rock group with three guitar players, a drum set, and much percussion – gave a noisy and spirited presentation of their own songs. Fairies and elves highlighted the Never-never-land scenes with improvised dances, and a rain dance composed by eight-year-olds accompanied the entrance of the Indian men. The Indian scene was a moving experience. Indian women, seated in a large, solemn circle, sang a song that two of the girls had written following classroom study of the Indian situation. But the children's spontaneity reached a climax during the interlude before the final scene, with its fierce battle in which the Lost Boys and Indians fight Captain Hook and the Pirates. In rehearsal, the opposing groups entered roaring savagely, but on the night of one performance the lights for the scene were inadvertently turned on before the interlude was over and the children, trained to listen to music, came in miming their fighting in silence. 'Go on, shout!' whispered their teacher urgently, and suddenly one lusty voice rose in an unrehearsed battle cry, 'Get on there, you bloody bastards!'

In the first week of the fall term this year, there was already a great demand to do another opera. Indeed, the older children had chosen the story – Frances Hodgson Burnett's *The Secret Garden.* To my surprise, since the story concerns a little girl, there was great enthusiasm among the boys. You can never tell.

Note: Margaret Galloway and her brother, Tony, design and produce Educational Musical Instruments. These include eight varieties of simple stringed instruments and soprano, alto, and tenor Shepherd Pipes.

Anyone interested is invited to write for brochures to:
Educational Musical Instruments,
46 Shilton Road,
Agincourt, Ontario.
Telephone: (416)293-5565

The first thing, I believe, for mankind is education. Whenever anyone does the beginning of anything correctly, it is likely also that the end will be right. As one sows, so one can expect to reap. If in a young body one sows a noble education, this lives and flourishes through the whole of its life, and neither rain nor drought destroy it.

Antiphon (5th Century B.C.)

Cooperative Education

Colin Campbell, Whiteoaks Secondary School

The following article is condensed from an extensive study made by the author in the winter of 1970/71. The premise on which the study is based is that the existing secondary school curriculum is fragmented and fails to provide many students with developmental opportunities. Findings suggest that cooperative education (i.e., work experience) can do much to correct this situation. In all matters relating to cooperative education, it is understood that the school will serve as coordinator, integrator, and synthesizer. A copy of the study is available from the author for those who wish to pursue the matter in depth.

It has become fashionable in recent years to base criticism of the educational system on dropouts and on some of the more spectacular products of the schools, for which the schools, rather than the society that produced them, get the blame. Professor Paul Goodman, a noted social critic, has the following to say:
'For advanced countries, a chief cause – perhaps the chief cause – of alienation of the student has been the school systems themselves; it is ironical . . . we go to extraordinary expense and effort to provide schools which estrange and unnerve him, that convince him he has no calling and no adult community, and nobody pays attention to him.'

In my view, we have focused attention on the dropout and the marginal achiever and have overlooked the large number of secondary school students for whom the curriculum has never had much meaning. But their need too is urgent, and something new must be added to give greater validity to their general education and prepare them for work. Appropriate additions alone, however, will not correct the inadequacy of the curriculum, for the traditional curriculum has a further serious weakness in that it fails to present a fully integrated program in which each subject is related to all other subjects. The parent, the guidance counsellor, and the classroom teacher have a responsibility to relate the curriculum to life, and if this relationship cannot be readily demonstrated, it is not surprising that the connection between school life and real life is not clear to many students.

Our changing society heightens the need for a curriculum that is relevant to life and will equip young people to be productive and creative in the face of continuing change, but a number of existing conditions serve as obstacles to progress in the direction of greater relevance. Among them are:

The tradition in educational systems whereby most administrators reach their positions by virtue of their experience in formal education only. For the most part, they lack practical knowledge and experience of the outside world for which the vast majority of students are bound. This somewhat proscribed experience is in turn reflected in the curriculum. Teachers who have had practical exposure to the world of work are a small minority and as a result have virtually no voice in decision making.

The division that still persists between technical, business, and academic curricula. Despite official pronouncements to the contrary, teachers and students are aware of it.

The human being's natural resistance to change. Technical teachers resist attempts to reduce the degree of specialization in their curricula, and academic teachers continue to be remote from technical curricula. The resulting situation cannot be considered advantageous to students who encounter both kinds of teachers.

The continuing stress on the acquisition of discrete job skills that have limited occupational scope – and this despite recognition of the daily accelerating rate of technological change.

The tendency in some places to think of vocational training as a means of developing manpower to meet local and industrial needs, which tends to be at the expense of individual development.

The widely held philosophy that university entrance is the only completely respectable educational objective, and the failure to recognize that individual differences in interest and ability offer a variety of other equally valid and respectable objectives.

Progress toward greater relevance in our educational system is urgently needed, and means must be found of overcoming the obstacles in its way. The student is right to demand relevance – to search for order and meaning in the curriculum. His educational experience will be richer and more productive if he sees it as relevant – if he understands how each subject relates to all others, how school tasks and rewards compare with real tasks and rewards, and how the curriculum relates to life.The teacher must try to make these things very clear to him.

Many years ago, Alfred North Whitehead, one of the wisest educators of this century, stated that 'the fatal disconnection of subjects robs the curriculum of its vitality.' Mind you, it can be argued that regardless of the curriculum's disconnected structure, formal education has demonstrated its ability to prepare its devotees for the real world. But it demands a measure of devotion! What happens when the student has none and is occupationally rather than academically oriented? To such students the formal process is largely irrelevant. Is it not logical then to conclude that cooperative education, or community work experience, may be more relevant?

Through a questionnaire administered to 535 grade 12 students from three high schools – approximately 15 percent of the population of these schools and about 95 percent of the total grade 12 enrollment – I found that virtually all of the students were in favor of cooperative education. Significantly, only 40 percent regarded it as preparation for employment – that is, as job training. Since this particular approach seems to have a high degree of relevance to students, it is worthy of close examination. Is it possible that programmed and properly supervised work experience for adolescents can provide meaning, order, and relevance where the formal educational approach has largely failed?

What is work experience? Is it manual training? Character development? A substitute for an inadequate curriculum? An incentive? A source of income? Or is it an integral component of a dynamic curriculum – a more real experience than school with its simulated situations? And does it have equal or greater value in terms of personal development as opposed to vocational development?

Work experience programs are, surprisingly, fairly common in North America, and some of the most successful of them have been in operation for many years. In Ontario, such programs are comparatively new. Centralized ones are in operation in Hamilton, Ottawa, North York, and Etobicoke, while fragmented ones are being conducted in individual schools.

A detailed study of Ontario programs indicates that they are shallow in philosophy, narrow in scope, and exist for the wrong reasons. Although, predictably, the people responsible for their operation claim success, evaluation is uncommon, follow-up is rare, and objective research is almost unknown. There is no hard evidence to support claims that many benefits accrue from any of the Ontario programs. This is not surprising in view of the strictures under which the various groups operate.

Other countries, notably the United States, have developed outstandingly successful cooperative programs on the basis of three essential principles:
1) Adequate preliminary organization and continuing close coordination.
2) Establishment of real situations – e.g., pay for work done, discipline for lateness, carelessness, and shoddy work.
3) Recognition of work experience – i.e., that it is as important as school experience and should be given approximately the same time allowance.

The inertia of the conventional formal approach in Ontario is apparent in the unfavorable reaction of a high percentage of the teachers and administrators surveyed to the idea that students on work programs should be paid while registered as full-time students. This attitude fails to take cognizance of the fact that one of the best known and most successful educational programs in Canada – that of Waterloo University – is a cooperative program that hinges on student pay.

The Department of Education naturally requires that secondary school students remain under the aegis of the school principal, but to suggest that a student on work experience who is receiving pay as well as academic credit has moved out of the school's domain is plainly wrong. Control of work experience from its inception to its termination rests completely with the principal, and payment for work done in no way alters this situation. Payment is, however, a powerful motivating factor for the student and effectively underlines the reality of the experience he gains.

The plan I am suggesting is not a narrow, sectional program designed for a special group of students – as is the case with most existing cooperative programs –

but a completely new approach from which all students can benefit. The concept presupposes utilizing the community outside the school as an academic/vocational/occupational milieu. The county system in Ontario lends itself admirably to such an approach since individual schools can be used experimentally without committing the board to a completely different program.

Education in Ontario has become synonymous with high taxes. It is therefore not surprising that the general public takes a skeptical view of proposals for new programs, since the immediate conclusion is that they will add to present costs. If a program meeting the three basic principles outlined previously was *added* to the existing structure, costs would increase. If the whole school was reorganized around the new concept, however, significant economies, as well as an improvement in the educational process, would result. A look at potential areas of saving may be of interest.

The conventional school is designed to accommodate the entire student body simultaneously. This procedure is dictated by the existing approach and cannot be avoided as long as the programs remain unchanged. But if a substantial number of students were always out on work experience, the school could be designed to accommodate a number smaller than the total enrollment.

If staff were still employed on the basis of total enrollment, the pupil/teacher ratio would be much lower, providing conditions for quality teaching. If ratios were maintained at current levels, significantly smaller numbers of teachers would be required. Obviously, then, in a cooperative school economies are possible both in the building program, or initial cost, and in subsequent maintenance and salaries, or continuing costs.

Another matter of concern is the purchase and maintenance of expensive machinery and equipment required for technical courses. The equipment receives comparatively little use in conventional programs and is usually obsolescent, if not obsolete, when installed. If the constantly updated equipment available in the community could be used in a cooperative program, the educational experience would be substantially improved and the costs reduced.

It must be realized, however, that the special vocational school is another matter; the philosophy expressed here applies to it only in part, if at all. This type of school very much needs the cooperation of the community in providing opportunities for students to learn on the job. Perhaps even more important, its students need to gain confidence in their own ability to function in the community. Care must be taken that such schools are not required to compete with regular schools and that their students are not subjected to comparison with students who have different kinds of problems. These schools would still need to be large enough to handle all enrolled students simultaneously and should continue to be provided with equipment appropriate to their specialized needs.

Our educational system is based on the notion of equal opportunity, but the focus of our educational effort is still the university. In view of the persistence of the philosophy that sees the university as the only fully acceptable goal, it is not surprising that the word 'vocational' is associated with a second-class course in the minds of many people. It is derived from the Latin verb *vocare* – to call; one dictionary defines it as 'a divine call, a sense of fitness for, the work or profession for which one has a special sense of fitness.' Is it possible that we educators have been sending out our graduates with the right courses but lacking a sense of vocation? If we promoted truly vocational education, we would seek not only to develop the innate ability of our students but also to inculcate in them a sense of vocation. This might help them to discover what they do well, to see where they belong in the system, and to find out what they can contribute. To this end, the teaching staff might provide every student with a matrix into which his special competency could be fitted, thus eradicating the 'fatal disconnection of subjects' that rightly bothered Whitehead so much.

A Model Program for Cooperative Education

My investigation of cooperative education led me to design a model program. The design assumes the involvement of two or more schools under the same board. Space does not permit its presentation in full, but a summary outline follows.

Objectives

Provision of more relevant learning experiences
Close integration of theory and practice
Integration of the school with local business and industrial organizations

Creation of a bridge between the school and the society that shapes it
Establishment of a placement service

Type of Program
Can be operated over calendar year if desired
Provides work stations grouped in three occupational areas (students would select one area)
Divides time equally between work experience and school, with students spending half of each day at 'work' and half in classes
Offers academic credit and pay for work experience

Implementation
The decision to engage in cooperative education must take into consideration the extensive preliminary work required. Adequate preplanning is essential, and for the coordinator a full year of work before the program becomes operative is indicated.

Staff
At the administrative offices of the board there would be a program coordinator with a full-time secretary. In the individual schools there would be part-time teacher-coordinators recruited from the staff and freed from teaching duties for a part of each day.

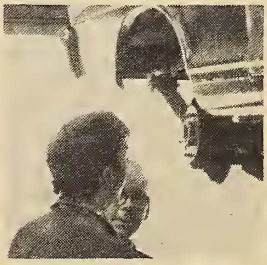
The coordinator – The coordinator's duties would certainly occupy many hours over and above the regular school day. This is a highly specialized position and the person appointed to it should be a successful teacher with a substantial technical-commercial background, have a pleasing personality and rapport with teaching staff, students, and employers, be a first-class organizer, and believe completely in cooperative education.

The coordinator's responsibilities would be numerous and varied. They would include:
program planning
enlisting employers
establishing work stations and training agreements
correlating classroom and work experience
establishing objective methods of evaluation
carrying out public relations activities (speaking to civic, business, and educational groups as required)
maintaining continuous liaison with business, labor, parents, teachers, and administrators
keeping up to date on parallel programs in other areas
conducting a continuous review of the program
handling publicity
operating a placement service for students and employers

The teacher-coordinator – The teacher-coordinator's responsibilities would include:
interpreting the program and providing occupational information to the students
handling programming and scheduling in conjunction with the school office
maintaining complete records
providing appropriate reports on students to the coordinator's office
correlating classroom instruction
assisting students with problems of adjustment
handling public relations activities as required
participating in professional development activities

Administration
The program would operate on the following basis:
Students would apply for entrance in the spring, and the teacher-coordinator would accept those appearing most likely to benefit from the experience
Written approval from the parents would be required on behalf of each participant
Orientation meetings would be held for students and parents
Pre-employment interviews with employers would be held. The employer could, of course, reject a student if he had reason to do so
Students accepted by employers would comply with company rules and regulations, or be returned to school and lose credit for work experience

School Program
The program would be organized in such a way that courses of study would be correlated wherever possible to the type of cooperative experience being gained. The program would not arbitrarily involve all students. Provision would be made for students expressing a desire to follow the regular academic course to do so. It is not the purpose of cooperative education to force students into an arbitrary mold, but rather to provide for them additional opportunities to realize their own potential.



Epilogue

'If you give a man a fish he will have a single meal
If you teach him how to fish he will eat all his life.'

Kuau-Tyu
(600 B.C.)

Games to teach thinking

Carl Bereiter,
Departments of Applied
Psychology and Curriculum,
OISE

Games are natural skill developers, but the skills they develop seldom have any use outside the game. This is especially true of 'thinking' games, such as chess and bridge. With experience, people get better at them, which means they are learning to think better. But they are learning to think better in extremely specialized and peculiar ways.

As part of a large OISE project titled 'An Elementary School Thinking Program,' we are trying to develop games for children that will develop a broad range of useful thinking skills. The strategy is to have a variety of games calling for different skills, and to encourage children to become fairly good at a number of games rather than specializing in one or two. It seems that the most useful learning occurs after the fundamentals of a game have been mastered but before skills have become too rigidly bound to the peculiarities of the game. At present we are concentrating on games for grades 1 to 3.

What Is a Thinking Game?
A thinking game, first of all, is a game. It isn't play or a hobby or an exercise. When the teacher passes out sheets of questions, and the child who gets the greatest number right is the winner, is it a game? One naturally says no, and we agree. It is just an attempt to dress up an exercise as a game. (It may of course be fun and educational – but that still doesn't make it a game.)

Every game involves difficulties to be overcome, but the crucial point seems to be this: in a *true* game the difficulties arise from the structure of the game itself. They are not 'fed in' in the form of set problems, riddles, or dares. The test is, does the game eventually become repetitious if there is not a supply of new difficulties fed in to it from outside? If it does, it is not a true game. Imagine the teacher handing out the same problem sheets every day. The competition would soon lose its edge. Even climbing Mount Everest would become repetitious after a while. Mountain-climbing is a challenging sport, but you have to keep feeding in new mountains. So it is not a game.

By contrast, true games – such as tag, hide-and-seek, chess, poker, and football – do not lose their challenge with repetition. Indeed, the play becomes more complex and interesting as the players become more sophisticated.

What makes a game a *thinking* game? We would say it is entirely a matter of degree. Any game of skill is likely to involve some thinking: a clever person will find some way to use his head to advantage. A thinking game is simply one where *figuring something out* plays a relatively large part, compared to luck, memory, speed, strength, and so on.

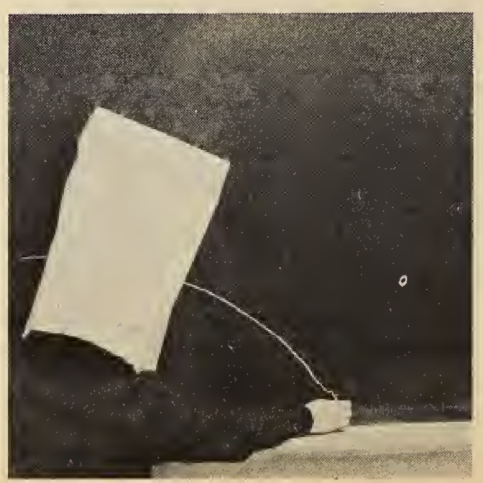
A Sample Game and What's Good about It
Name: Read-Around.
Players: Any number, 3 to 6 makes for the liveliest game.
Level: Any age, but all players must be able to read.
Equipment: A book that is easy reading for the players, but not one they know by heart.
Object of game: To win a turn as leader by guessing the next word in the sentence.
Procedure: Players sit in circle. Leader holds book, selects any sentence, reads first word. Player to left tries to guess second word. If he fails, leader reads first two words, and turn passes to second player to left, who tries to guess third word. Play continues until a player guesses word, then *he* becomes leader.

Example – *Leader:* 'After . . .' *Player 1:* 'the.' *L:* 'After lunch . . .' *Player 2:* 'was.' *L:* 'After lunch, Tom . . .' *Player 3:* 'and.' *L:* That's right. 'After lunch Tom and Linda went to the park.' Player 3 takes book and becomes new leader.

Thinking skills involve educated guessing, extrapolative thinking.

Some desirable features of this game are:
1) The game is actually fun. It may not sound like it from the description, but try it with whoever is handy and you will see.
2) Rules are very simple to learn.
3) Game requires no supervision.
4) No special materials are required.
5) It can easily be adjusted to the level of competence of the players.
6) There is an element of chance so that less capable players are successful part of the time, and no one is successful all the time.
7) The game can grow with the players. As players get more sophisticated, they start looking for harder sentences when they are leaders (i.e., sentences with less predictable sequences).
8) It isn't very competitive. No score is kept. Enough motivation seems to come just from winning a turn as leader.
9) In addition to whatever value it may have in training thinking skills, it gives practice in something else useful – reading and guessing words from their context.

Some Thinking Skills That May Lend Themselves to Teaching through Games
Pattern detection
Foreseeing consequences
Educated guessing
Interpolative thinking (figuring out the missing link)
Extrapolative thinking (figuring out what will come next)
Identifying needed information
Formulating questions
Inferring rules
Seeing something from several points of view
Defining
Identifying truth, falsity, and uncertainty
Inferring possible causes
Testing hypotheses
Thinking of possibilities
Detecting irregularities
Proving
Determining relevance
Persuading and resisting persuasion
Planning



Radar. A very simple game in using information. Child blindfolded with bag over head traces line on chalkboard, attempting to reach the little circle that someone has placed on chalkboard. Other children guide him by radar 'beeps,' beeping slowly when the line is far from the target, faster when the line nears the target.

Games should be designed so that children can manage them themselves. In this game the goal is to find an object in the room that one child is thinking of, by asking yes-no questions about its location. To restrain children from wild guessing and to prevent one child from dominating the questioning, children are dealt slips of paper and must 'pay' for each question they ask with a slip.

Formulating problems
Using analogies
Using maps
Using logical representations
Using negative information
Checking for errors and omissions
Anticipating actions of others
Inferring motives
Thinking of examples
Recognizing progress toward a solution
Identifying contradictions
Categorizing
Applying rules
Explaining
Deducing conclusions

This is not an exhaustive or organized list. But it has served as a stimulus to thinking up varied games, and may do so for the reader.

Some Thinking Skills That May Not Be Teachable by Games
This list is short but includes some very significant kinds of thinking.

Curiosity-motivated inquiry and investigation
Subordinate skills may be developed in games, but the content of games appears to be incompatible with curiosity.

Artistic thinking
It is possible to have games requiring players to produce designs, poems, or songs, but the game imposes its own criteria, which it seems are generally antagonistic to aesthetic criteria and to self-expression.

Understanding others
Poker probably teaches players to understand other people, but for the purpose of exploiting them. This seems to be the tendency in games. But *perhaps* games can be devised that require the ability to understand others without developing the intent to exploit. (A simple example of this would be a game where a blindfolded player tries to identify others by feel. Of course, this doesn't involve much understanding.)

Moral reasoning and judgment
One might, however, be able to devise a (fiendish) game that is fun to play but where the rules are so ambiguous that they frequently lead the players into having to argue out what is fair.

Strategies for Devising Thinking Games
Games that children play spontaneously don't involve much thinking. 'Educational' games available from publishers and in literature for teachers don't either. They are mostly for learning concepts or developing skills in reading and computation.

Three strategies we have found helpful in designing thinking games for young children are these:

Simplify a more difficult game
Example – Chess encourages foresight, but the number of alternatives to consider overwhelms most young children. A solution may be found in a game called Foresight, illustrated below, which involves only one piece per player. Only when one's piece is on an empty square does one have a choice of moves, and then the choices are eight at most. Yet the need for looking ahead to see what one is letting oneself in for is just as great in this game as in chess.

Increase the thinking content of a game children already play
Example – Battleship, or Salvo, is a game of enduring popularity. Ships are placed on selected squares of a matrix. The opponent, who doesn't see the array, calls off matrix locations in an effort to hit all the occupied squares. The game has considerable suspense, but is almost all luck. A variation that involves more thinking is one in which selected squares of the matrix are blackened to form a large letter of the alphabet. The opponent calls locations as before, but he doesn't have to identify all the occupied squares in order to win, only enough for him to determine what the letter is. This requires both interpolative thinking and deduction.

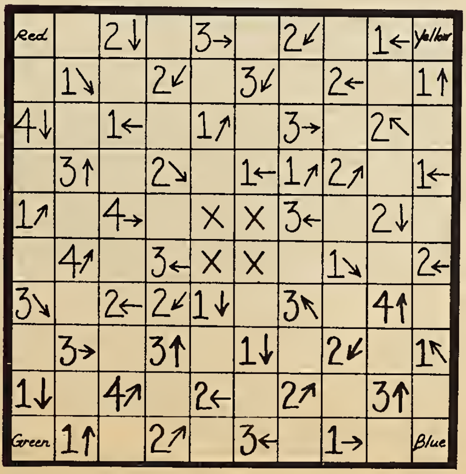
Turn a teacher-led thinking task or activity into a game
Example – Exercises in defining sets are favored in modern mathematics and science curricula. A related thinking game may be played using a large deck of cards that the children make themselves by pasting magazine pictures on to 5" x 8" cards. Each child is dealt one card face up. The object of the game is to win cards, and this is done by telling something that is true of your card and of some but *not* all of the other cards. You win all the cards that fit the class you have defined, unless all the cards fit, in which case you do not win any.

Can You Help?
We know that many teachers have good ideas for games. We are prepared to pay from $10 to $150 for game ideas, depending on how fully worked out they are and what use we are able to make of them. The games should be ones that require thinking – not just memory, luck, or persistence. We are looking for games that have the nine desirable features previously listed for the game of Read-Around. They don't have to be sitting-still games, however. We are also interested in active outdoor games that involve thinking.

We prefer games that will not cost a teacher any money or require a large amount of effort to prepare materials. A really good game that needs materials will be considered, however.

Send game ideas to:
Carl Bereiter,
Department of Applied Psychology,
The Ontario Institute for Studies in Education,
252 Bloor Street West,
Toronto 5, Ontario.

Please don't send along any materials that you will need back because we can't be responsible for returning them.



Red		2↓		3→		2↙		1←	Yellow
	1↘		2↙		3↙		2←		1↑
4↓		1←		1↗		3→		2↖	
	3↑		2↘		1←	1↗	2↗		1←
1↗		4→		X	X	3←		2↓	
	4↗		3←	X	X		1↘		2←
3↘		2←	2↙	1↓		3↖		4↑	
	3→		3↑		1↓		2↙		1↖
1↓		4↗		2←		2↗		3↑	
Green	1↑		2↗		3←		1→		Blue

Foresight. Move your piece to the opposite corner before opponent moves his piece to yours. Move one space in any direction, if you are on a blank square. If you land on a marked square, your next move must be the indicated number of places in the direction the arrow points. If the other player blocks you from making a required move, you lose your turn. When you land on some marked squares, your moves are determined for several turns away and you may end up farther from the goal than when you began. That's where foresight comes in.

Promotion des arts à l'école

Gérard Gilbert, Office of Field Development, OISE

Nous sommes en train de franchir une étape capitale de notre histoire. Aussi importante, a-t-on dit, que le fut le passage de l'animalité à l'humanité. Et l'un des résultats prévisibles en sera cette civilisation des loisirs dont on parle souvent.

Notre société se passera peu à peu de mains pour l'exécution des tâches, l'automatisation accomplissant les besognes plus vite et mieux. A quoi s'occuperont donc les gens? Car même alors l'oisiveté sera malsaine et peu rentable.

Sans doute beaucoup de temps s'écoulera dans la passivité (en est-ce une?) du spectateur, de l'auditeur, aux pieds desquels les machines électroniques déposeront le monde tout entier. On en donnera davantage aussi aux compétitions sportives, aux voyages, aux divertissements sociaux.

L'homme normal pourtant veut créer. L'univers des arts s'ouvre devant lui, comme un rouleau indéfini de créations possibles que suggèrent la sensibilité et l'imagination. Son intelligence, ses sens aiguisés, les techniques modernes sont les outils à sa disposition. Le former à vouloir s'en servir importe extrêmement.

L'école – qu'on dit toujours préparatoire à la vie – doit en tenir compte. Elle diminuera certaines matières secondaires du programme pour y inclure les arts. Qu'y perdra-t-elle? Rien. Le stade des études élémentaires – et même des études subséquentes – a pour but principal de mettre en état d'apprendre. N'a-t-on pas répété que la culture c'est ce qui reste après qu'on a tout oublié? Il ne faudrait pas grossir indûment l'importance des connaissances acquises entre la 6e et la 12e année en classe. Certains vont même jusqu'à exiger un revirement d'attitude à l'université: moins de remplissage de cerveaux, plus de formation de l'esprit.

L'école non seulement n'y perdrait pas à un allègement de la matière à transmettre aux élèves, mais y gagnerait dans une ouverture beaucoup plus grande sur le vaste univers de la création artistique.

Commencer tôt à former au goût du beau sous toutes ses formes, répondre au désir naturel de création des jeunes: musique, chant, littérature, théâtre, discours public, dessin, peinture, céramique, sculpture, photographie, cinématographie, artisanat, etc. Mettre sous leurs yeux et offrir à leur ouïe, très fréquemment, les productions variées de l'art, qui sont vie de l'esprit autant que les disputes de mots du genre: combien d'anges pourraient trouver place sur la pointe d'une aiguille? A partir de la 10e année peut-être, enseigner les techniques des divers arts.

En résumé, les beaux-arts doivent être intégrés à l'école. Ce n'est pas dire qu'il faudra allonger les programmes, mais plutôt autoriser un dosage moindre en certaines matières. Toujours en cherchant à développer la personnalité globale des élèves. Inclure des matières artistiques nombreuses aux programmes scolaires. La société à venir, et toute proche, exigera que chacun développe sa créativité.

Se hâter d'appliquer les recommandations du Rapport Saint-Denis sur la vie culturelle des Franco-Ontariens (janvier 1969):

Recommandations au ministère de l'Education de l'Ontario (extraits)
Embauchage de spécialistes francophones en arts plastiques dans les écoles élémentaires.
Cours de création dramatique et d'initiation au cinéma à l'école élémentaire.
Cours d'initiation à l'art dans les classes de la 9e à la 12e à l'école secondaire.
Cours facultatifs en français dans toutes les disciplines artistiques au niveau de l'école secondaire.
Enseignement complet en langue française dans les collèges communautaires.

Recommandations aux universités bilingues
Création d'une section exclusivement française dans les départements des Beaux-Arts des universités.
Mise sur pied d'une faculté de musique.
Formation d'animateurs culturels français.
Création d'un département de communications et d'un institut de recherches scientifiques sur les Franco-Ontariens.

Recommandations aux écoles normales
Cours d'initiation à l'art, de musique, de phonétique et de diction.

Recommandations aux commissions scolaires
Aménagement des locaux nécessaires à l'enseignement des arts plastiques.
Embauchage d'un directeur musical et d'un conseiller pédagogique spécialisé en expression orale.

Recommandations aux institutions fédérales
Etablissement de stations françaises de radio et de télévision en Ontario.
Formation d'un réseau franco-ontarien de radio et de télévision de Radio-Canada.
Tournées de la troupe du Centre des Arts dans les centres francophones.

Recommandations à différents organismes
Augmentation du nombre de livres français de qualité dans les bibliothèques publiques.
Introduction du français dans les galeries d'arts de la province.
Mise sur pied de cours pour adultes et de programmes de loisirs pour la minorité francophone.

A Practical Design for Program Evaluation

K. A. Leithwood and H. H. Russell,
Trent Valley Centre, OISE

Ontario schools are now experiencing two associated pressures that are creating a need for more sophisticated approaches to the evaluation of student achievement. One of these pressures results from the considerable autonomy in curriculum development that has been given to the schools by the Ontario Department of Education; the other stems, in large part, from the present provincial, national, and international economic problems which have resulted in the now familiar call for educational accountability.

The process of curriculum development includes, as an integral part, formative evaluation – evaluation that assists in developing curricula according to specified program goals. (This type of evaluation was the topic of an article, 'Evaluating Achievement of Educational Objectives,' *Orbit 9,* 1971, which serves as background for this discussion.) Such evaluation may legitimately be carried out on a non-comparative basis; in fact, many evaluators suggest that introducing comparison into formative evaluation stifles program development because the program being evaluated must remain static while comparisons are taking place. Comparative evaluation may give rise to other problems as well. Any evaluation of student achievement is either implicitly or explicitly based on the objective of the program, and the most meaningful comparison of the effectiveness of traditional and innovative programs must be based on identical criteria – that is, the achievement of educational objectives. If an innovative program is introduced to achieve educational objectives different from those of the traditional program, the comparative criteria will differ and comparisons between the two will be invalid.

Educational objectives, nevertheless, do not change rapidly, as evidenced by the relatively small number of 'new' objectives contained in the Hall-Dennis report. New programs in a given area of study often differ with respect to materials, techniques, and specificity of goal articulation, but congruence of intent with existing programs often makes comparison possible.

Historically, experimental designs for program evaluation have created far more problems for practitioners than they have solved and associated statistical analyses of data have been understandably difficult to interpret. It is our intention to outline one design that makes possible meaningful comparisons between programs and that is feasible for schools to employ. This design was developed and has been successfully used in the evaluation of several programs in the Peterborough project (which is described in *Orbit 5,* 1971) and is now a standard evaluative tool of the OISE Trent Valley Centre.

An adaptation of what D. T. Campbell and J. C. Stanley call a '*pre*-experimental static group comparison' [*Handbook of Research on Teaching* (Chicago: Rand McNally, 1963)], this design compares the post test results of a class that has experienced a new program with one that has not; the purpose is to establish the effect of the new program. The major weakness in this method, as designed by Campbell and Stanley, is the lack of means of determining initial group equivalence; the groups might differ irrespective of the different programs. Efforts to match groups on selected background characteristics are usually ineffective or misleading because only a few student characteristics are ever used in the matching and there is no assurance that these are the critical ones for the purposes of comparison. The method of grouping students is therefore the major flaw in this particular design. This flaw can be eliminated by randomly assigning students to each group and the design then assumes the stature of a '*true* experimental static group comparison.'

Mrs. Smith's Kindergarten Classes –
1971/2 and 1972/3

September 1971 Class given traditional program		**September 1972** Class given innovative program
June 1972	Children given innovative program posttest	**June 1973**

mean class achievement scores for each innovative program objective are compared

The accompanying figure illustrates our adaptation of the Campbell and Stanley design for program evaluation. We feel that it is a useful compromise between the 'pre' and 'true' experimental designs, overcoming many of the limitations of matching by choosing the comparison students from the same setting as the students receiving the new program. The figure shows that, in the case of an innovative kindergarten program being introduced to Mrs. Smith's 1972/3 class, the comparison group will be Mrs. Smith's 1971/2 class, which will then be in grade 1.

Because the two classes have had the same teacher and come from the same community, the assumption of group equivalence can be made (except in rapidly developing communities) with only slightly less confidence than would be the case if the students had been randomly assigned to each class. The assumption of group equivalence negates any need for pretesting. It has one very practical advantage – a teacher who decides in the spring to begin a new program the following school year is still able to gather control data for comparative purposes. Operationally, Mrs. Smith would test her 1971/2 class in June 1972, after the pupils had been given the traditional program, and would use a criterion test from the innovative program to be implemented in 1972/3. The mean scores her class received on this test would then be compared with the mean scores her 1972/3 class received in June 1973. Any major differences between the two sets of mean scores could be safely attributed to the effects of the new program. Maturation, effects of testing, teacher variation, and most other serious threats to the validity of interpretation are controlled through this design. The fact that there is an interval of one year between tests is virtually the only variable that might reduce the confidence one could place in assigning responsibility for achievement differences to the new program. Many teachers will immediately say, and rightly so, that their classes show important behavioral differences from year to year, ones that are not controlled with this design and would affect mean class achievement scores. Suffice it to say that such differences would not be controlled by random selection either, and that the teacher's subjective knowledge of these behavioral differences should play an important role in her interpretation of the more objective and less sensitive data.

This design also has a number of other practical advantages, the major one being that it is economical. Comparison groups are always difficult to find, and non-innovative schools are understandably reluctant to participate in studies in which they see few advantages for themselves. With this design, both the comparison and new program groups can be taken from the innovating school.

Sampling Technique

Most educational programs have more objectives than one student can be tested on in a reasonable length of time. Yet failure to evaluate all objectives leaves teachers open to the charge that they have merely 'taught to the test' – the test reflecting only a fraction of the program's intent. The same charge must be considered a compliment, however, when the test reflects all program objectives. The methodological problem is how to resolve these two issues.

When programs rather than students are being evaluated, options can be introduced that are easily but not often used in school settings. One such option employs the technique of random selection, which appeared so impractical with regard to assigning students to groups. Rather than giving all test items to all students, reliable information can be obtained by randomly assigning test items to subtests and the subtests to students within a class. Suppose, for example, that in order to evaluate achievement of the 50 objectives of a new program given to a class of 25 students, 4 test items per objective or 200 test items in total were needed. Rather than attempting to give all items to all 25 students, one solution would be to randomly divide the test into 5 subtests of 40 items each and randomly assign these subtests to the students. The mean score for each test item would then be based on the answers of 5 rather than 25 students, with reasonable justification for considering these mean scores a reliable reflection of total class performance.

Such a sampling technique, used in conjunction with the evaluation design outlined previously, provides dependable program evaluation data that can be readily and inexpensively gathered yet, at the same time, adequately meets the pressures of curriculum development and accountability. It should be pointed out that doing away with pretesting and randomly assigning items to students rules out using the resulting evaluation data for student diagnostic purposes – a very important testing function, for which additional evaluation would have to be introduced.

“

I have just marked nearly 500 GCE scripts at '0' level. English Language, the title said. You could have fooled me.

As one of my colleagues put it: 'Some of them don't need marking – they need translating.'
How right he was! I barely understood sentences like these: 'The sun was shinning and the day tripers injoyed the carm and beaty and quite of the peesfull countryside.'
or
'My fiend becan to feel nervus and startid to swet.'

But I really did get a little bothered over sentences like this:
'Irriterbul dad cliped peets eerol hes allways up to all posiable mischiff amanagebel.'

The more I read, the more puzzled I grew. Was this the work of teenagers, many of whom had passed the 'eleven-plus'? Could this be the Queen's English?

Originally published in the *London Daily Mail*

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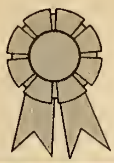
Whatever Happened to Excellence?

B. P. A. Ertis,
Peel County Board of Education



I recently attended a workshop sponsored by some educational leaders (names and positions are being withheld in order to protect the guilty). Naturally I was interested in acquiring any relevant new information that might have been forthcoming during the session. And I did. I learned that 'if your interest lies mainly in the transmitting of skills, you have little interest in the children' and that 'teachers should seldom set anything out that can be marked wrong, since children should always be in situations where they are right.' Such is the wisdom of our educational counselors.

Perhaps I shall be accused of taking things out of context. My accusers would be right. But these statements should not only be taken out of context – they should be taken out, period. And along with them should go the damaging inferences, connotations, and the highly questionable sources from which they come.

Within the framework of such statements is grounded a good deal of present educational practice. Were we gullible enough to accept these premises per se we would have to completely alter the course that education is pursuing.

The Question

Why, really, do we have our children attend school? Is it because we feel they are in dire need of love and affection? Is it because we want to shelter them from the real world of competition, aggression, and our may-the-best-man-win philosophy? Is it because we are presumptuous enough to believe that only we can understand them? Unfortunately the answer to these questions is yes, but it should be no.

As for the first statement, criticizing the transmitting of skills, priority number one in my books is just the opposite. That is why teachers get paid! That is what parents expect! That is the educator's main task! And if teachers don't believe this, then what are they doing in the classroom for five hours a day?

This brings me to the second statement, namely, that children should always be in situations where they are right. Naturally we wouldn't want to destroy their egos. By extension, this would imply that, when instructing children in traffic safety, teachers would be able to tell the children when their behavior in traffic is right but not when it is wrong. Yes, they may be right. Dead right! Is there not a right answer to a given mathematical equation? Is there not a correct way of reading? Is there not a proper method for written expression? Similarly, are there not incorrect answers and improper methods? I submit, for your consideration, that few people learn from being right, and many more learn from being wrong. The concept of 'rightness' has little import unless the concept of 'wrongness' is also understood.

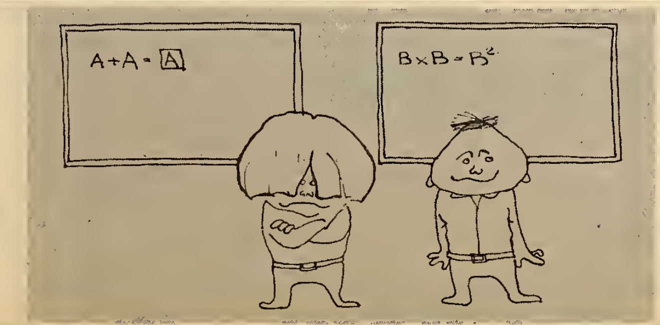
The truly successful people today did not become so by being right all the time. They were wrong many times. They made mistakes many times. They knew failure many times. Still they succeeded. They learned to work and work and work at mastering their errors, until they became so proficient that they were right more often than they were wrong. It is such people who have made performance, achievement, and excellence the stepping stones to success. So many of today's educational leaders believe in the virtues of allowing children to proceed at their own comfortable rate, of easing the pressure, of relaxing the controls on discipline, and, generally, of allowing children to learn at whatever speed their mood dictates.

Well, I don't buy it! The material world which these students will be entering and which we are supposedly preparing them for demands that if they are to succeed they must be competitive, aggressive, and show promise of performance under pressure. They must learn to be above-average achievers and to be oriented to excellence. If we don't instill these values, in my opinion, we are wasting time and the taxpayer's money.

The essence of excellence can be applied to any job, trade, or profession in life, and only those whose minds and bodies have been tempered in the demanding discipline of life will rise above the mediocrity of the masses and succeed in whatever endeavor they undertake.

And that, in today's lingo, is where it's at, baby.

Mr. Ertis is the author of A Place in Time *– a recently published collection of contemporary verse. Copies may be ordered ($2.50 each) from local booksellers or directly from:*
Dorrance & Company, Publishers,
1809 Callowhill Street,
Philadelphia, Pa. 19130, U.S.A.



SOCIAL CLASS AND READING ACHIEVEMENT

Margaret E. Clifford,
Northumberland and Durham County
Board of Education

Does the family into which one is born affect academic achievement? Do our schools enable children from low socioeconomic levels to achieve as much of their potential as those from higher ones? I determined to gather and examine data to see whether I could find any relationship between the socioeconomic backgrounds of children who had reading difficulties and those who did not in the school where I teach.

The Community

A number of the children in our school come from families who earn at least part of their living by farming. Most of the men who farm also have another job, or their wives work. Some take seasonal jobs, working at tobacco, fruit, or Christmas-tree harvesting, but more often they are employed in factories in communities nearby.

Although most families in the community appear to have acquired a middle-class life style, income ranges from that of a self-made millionaire to that of a family who lives on relief in a dirt-floored tar-paper shack that once housed chickens.

The School

Our school was built about eleven years ago to replace the one-room schools in the area. All of the teachers were kept on, and one was made the principal. At present, six of the ten teachers on the staff have been there since the school opened.

When Bea was first made principal, she wanted very much the respect, almost the reverence, of her staff, but sometimes she lost it by issuing an ultimatum, allowing no one to express an opinion. As a play on her name, the staff nicknamed her 'Queen Bee.' Her position of power was never challenged, and gradually Bea began to relax and act less formally with the staff. When one of her staff members began making a pot of coffee in the unused staff room, Bea joined the others, and after a few stilted sessions began to talk about her ideas and policies. We now have regular staff meetings. The principal is still very much in charge, but she asks our opinions now, listening as we exchange our views and forming her policies and making her decisions on that basis.

The fact that the children seek Bea out to tell her their problems speaks well of her relationship with them and her ability to interact with young people. From the children she requires respect and obedience. They are expected to function within the established rules of the school. Children who have trouble fitting in are brought to the office, where they are usually talked to behind closed doors. Bea knows every child by name, and his background and achievement. Significantly, when talking to a small child, she bends right down until she is at his level. She often touches a child caressingly when she talks to him, buttoning a stiff coat button, tying a shoe, smoothing down the child's hair, or putting an arm around his shoulder.

Since buses run on a shift system, with each bus making a double run, there is a thirty-five minute waiting period between runs. Bea insists that the children be allowed to remain in their classrooms on cold or rainy days after dismissal. This is the first school where I have taught that this courtesy has been extended to the children.

I have never heard our principal make a disparaging remark about a child's family background, nor does she gossip.

To summarize, then, our principal insists that the schools are made for children – not the teachers. If I may be permitted a value judgment, this is the way it should be.

The Children and Their Differences

In the course of a week, I see fifty-seven pupils for help with reading disabilities. The children come singly or in small groups for a period of twenty-five to thirty minutes, two or three times a week. Who are these children? Are they the 'slow learners'? Forty have I.Q.s within the 90 to 110 range. Two test slightly above and fifteen below this range. Five test below 80 (however, anyone experiencing reading difficulties will have trouble coping with written I.Q. tests; results must be taken with a grain of salt).

What I hoped to find out through the data I gathered was what makes the children in this particular group different from the children with comparable ability who can read easily and with enjoyment, and whether there is anything they have in common that the rest of the school does not share.

My first step was to find a control group for the fifty-seven children receiving special instruction in my classes. This I did by referring to the pupils' Ontario School Record cards and selecting mates on the basis of I.Q., age, and grade level. Since there were thirty families with children involved in the reading program, I also selected thirty families with children in the control group for comparison.

The data I collected showed that the socioeconomic background of the two groups differed markedly. The principal breadwinners in the remedial group families generally had less formal education or training and were more often unemployed or supplemented their income, if they were farmers, through other work.

Nearly a quarter of the children in the remedial group either came from one-parent homes or had failed a grade (sometimes both); this was true of only one or two in the control group. The family size was also noticeably different – the average number of children in the remedial group was 5.9, as opposed to an average of 2.3 in the control group. Indeed, twenty-two of the children in the remedial group came from families with more than six children. This is probably

one reason why both parents worked either full or part time in only three out of thirty families, compared with ten out of thirty families in the control group. It would be extremely difficult for the mothers of large families to leave their homes to take a job – even when by virtue of the very size of the family other income is more needed. Paradoxically, the greater the need for a higher income, the less is the family able to provide it.

I also looked into what might be called 'status symbols' in the two groups, thinking that this might provide another index to the socioeconomic background of the two groups. The results shown in the table on the next page indicate that there were indeed substantial differences. The members of the control group apparently had appreciably more income available for such nonessential items as Ski-doos, wigs, and trips.

But the information I found most revealing was not statistical at all. The appearance of the children from each group contrasted greatly. Of course there were exceptions to the norm in both groups, but here are some of my observations.

The children from the control group were well and warmly dressed. Attention had evidently been paid to such details as color harmony, matching buttons, hem length, fit, and general grooming. The children from the remedial group generally needed dental and orthodontal care, haircuts, and often a bath. Clothes were often too large or too small, left unrepaired, pinned, or unironed, with the old hem mark still showing where alterations had been attempted. Smelly sneakers and running shoes, even in winter, seemed to prevail. Boys often appeared in sweaters that had once been larger but had shrunk and matted with repeated washings or poor washing techniques, been handed down from their father or an older brother, or bought at a rummage sale.

In other words, the division in our school between those who have and those who have not seems to be reflected in their reading ability. Why should this be so?

The Child's Self-Concept

There is general agreement among researchers that students who underachieve scholastically or fail to live up to their own expectations suffer significant losses in self-esteem; conversely, an aura of success induces self-esteem.

As a general rule, we can say that any behavior of significant people in a child's life that causes him to think ill of himself, to feel inadequate, incapable, unworthy, unwanted, or unloved, is crippling to the self. Where respect and warmth are missing, where the child's questions go unanswered, where his offers of help are rejected, where his discipline is based on failure and punishment, where he is excluded from his parents' emotional life, and where his basic rights are abused, his sense of self is undermined.

Was this what was happening to some children in our school? Were the lower-class children conscious of their inferior social position, and were the teachers influenced in their expectations of a child's performance by his background? Were these children discriminated against by their peers? My observations showed that too often the answer to these questions was yes.

How the Child Sees Himself

Such a statement as, 'My father did not do very well at school either, and I take after him,' reveals that the child expects to do poorly also. Most refer to themselves as failures or as being dumb. They expect to do badly in school.

One of the senior classes in our school went through a Water Resources Conservation Region, each student compiling a project on it afterwards. The five students that I see from this class cornered me to read their projects before handing them in. All had done a considerable amount of research, mapmaking, and graphing. Each project, to my eyes, represented a monumental effort for that particular child. But all five said, 'There is no sense turning it in. I never get a good mark no matter how well I do it.'

How the Teacher Sees the Child

Each teacher brings to school not only her pedagogical training but also attitudes, biases, and personality that have been formed as a result of her own social class and status. Most of us lack the experience in our own backgrounds to have empathy with children from poor homes. It is easy to dismiss the grubby state of a child's appearance by saying, 'You can't make a silk purse out of a sow's ear,' or, 'Like father, like son!' We have no concept of the poverty that compels a child to use string instead of shoelaces. Merely, 'For Heaven's sake child! Why doesn't your mother buy you some shoelaces?' We note the lack of nutritional foods in the noon lunch boxes and comment, 'Why don't you bring more to eat?' Children bring what mother can afford to send.

We scold children for being untidy, for having messy desks. Children who come from crowded homes where the contents have to be kept in a small space, or from homes where mother will not win the Good Housekeeping Seal of Approval for her efforts, will have no experience, model, or ability to organize sheets of stenciled seatwork, crayons, pencils, and assorted junk. A child labeled by us as untidy will undoubtedly live up to his reputation.

Such remarks as 'How do you expect to keep your feet dry with rubber boots like those?' 'Tell your mother to hear you read – you are a very poor reader and must read every night,' 'Will the slow readers please come up now,' strengthen the child's developing self-image as a failure. The comments we write from year to year on a child's

Ontario School Record Card can brand him for life by influencing the opinions his succeeding teachers will have of him.

How Children See Each Other

It is interesting to hear a child disclose his family's class and status conversationally. He doesn't say, 'We have money; you do not. My father is important; yours is not.' He chatters about sneaking out onto the highway with the family Ski-doo, about his brother taking the 'other' snowmobile. He brags about beating the old man at pool in the rec room. He trades prerecorded cassettes with his classmates and lugs his various electronic portables around the schoolyard.

The majority of the school population have adequate clothing. Some wear their Ski-doo boots and suits to school; others don't even have socks that match. Some have traveled widely with their parents; others have not even been to town for groceries often. For them, riding the school bus is their only travel. Three grade 7 girls have wigs; others may have a typical done-at-home-with-a-bowl haircut.

By last June, every boy with a bicycle had acquired the stylish long-horn handlebars and glittering elongated saddle seat. The bicycle racks displayed a uniformity of expensive gadgetry on every vehicle.

The well-heeled girls wear long, tight-fitting, expensive pull-on boots. On the playground one can easily distinguish gatherings with this sleek, long-legged look, mingling among themselves.

There are many situations in which the children interact with each other in ways representative of their group. Many from the lower-class group are docile, stepping out of the others' way, constantly moving backward in a queue at the fountain as others push in ahead, staying close to the teacher on yard duty as if for protection, turning the skipping ropes much longer than others because they take turns when they miss and are deliberately tripped up when they skip, never forming part of the infield or acting as batters when positions are called for scrub baseball, being the last chosen on teams, and usually sitting at the back of the classroom. Others from this class are very aggressive and argumentative. Often they cannot function within the norms of the school, and so get into trouble.

Peer influence tends to buttress the developing self-images of the remedial reading group as failures in the educational system. John Goodlad, in his studies of nongrading, found that fellow students play an important role in providing or withholding support, respect, approval, and knowledge. To fail, as fourteen of these children have, is to promote and extend the concept of worthlessness in such children. Promoted slow-learning children achieve at higher levels, are involved less often in aggressive acts toward school and schooling, get along better with their peers, and appear to have more wholesome feelings of personal worth. Upper grade achievement levels are higher in schools that have low non-promotion rates.

The Child's Home Environment

Children learn from the moment they are born. Preschoolers are conditioned for school by their experiences in daily living. A child's chances to learn by his five senses are largely determined by his environment. The family that places a high value on reading, dialogue, observation of the world around, formation of ideas, formal education, pleasure in work, and pleasure with each other provides an environment in which a child's mind can explore. If time is sacrificed because of an inadequate standard of living or the extra work involved in raising a large family, the environment is less conducive to the child's learning the art of wondering, questioning, and imagining. Words and their connotations are not important to him, nor does he develop a curiosity about language or the symbols we use for it.

Bernstein, in *Social Class and Linguistic Development*, postulates that the lower working classes restrict their language to short, grammatically simple sentences, devoid of adjectives, adverbs, and conjunctions. They tend to couple traditional phrases and stereotyped responses with description employing concrete, tangible, and visual symbolism. The middle-class child is brought up in an environment that places great value on verbalization and conceptualization, on using complex grammatical structures, colored by adjectives, adverbs, and conjunctions. The middle-class child's language tends to express feelings, abstract ideas, and conceptions. This necessity to verbalize exposes him to a whole range of potential learning denied the lower-class child, whose family employs a more limited linguistic mode.

The Role of the School in Effecting Social Change

Questions remain. Is it the province of the educational system to conserve social structures? Does an existing social order have the right to use the school in maintaining itself, and conversely, does an educational system have the right to lead in establishing a new social order? Is education its own end or is it a means to an end? Should educational expectations of children be measured by the socioeconomic status of their parents? Is educating a child beyond his social class or economic expectations wrong? Can an educational system serve at one and the same time the interests of all strata of society? If so, then on what culture should the main part of the curriculum be based?

Even though the children I studied had comparable abilities, the children from the families with lower incomes seemed programmed to expect failure or lower levels of academic achievement.

Status Symbol	Remedial Group (%)	Control Group (%)
Has your family ever owned a brand new car?	10.0	43.3
Does your family own a Ski-doo?	6.6	40.0
Does your family own a TV ?	96.6	100.0
Does your family own a color TV ?	6.6	20.0
Does your family own a clothes drier?	10.0	50.0
Does your family go away for vacations?	6.6	53.3
Does your mother have a wig?	3.3	20.0
Do you get an allowance?	10.0	30.0

TEACHING AIDS FROM THE COMMUNITY

CANADIAN GENERAL ELECTRIC

The materials listed below are available, free of charge, from the Canadian General Electric Company Ltd., 214 King Street West, Toronto.

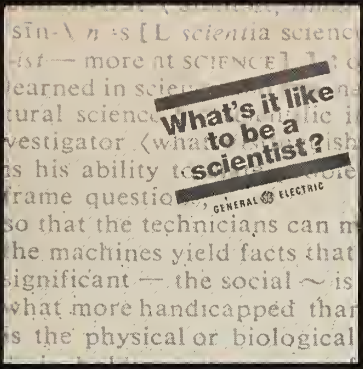
PUBLICATIONS

Edison and Electricity
The story of Thomas Alva Edison, told in a pamphlet suitable for use by elementary school students. (Illustrated)

Nuclear Fuel Operation
A brief description of processes and techniques used in the manufacture of nuclear fuel and some of the products and services provided by Canadian General Electric. (Illustrated)

You and Tomorrow
Tomorrow's workers will face job opportunities that do not yet exist. This booklet suggests how today's students can best prepare themselves. (Illustrated)

What's It Like to be an Engineer?
A brief look at the different types of engineers and the areas in which their skills and knowledge are utilized. (Illustrated)



What's It Like to be a Scientist?
A glimpse of the current areas of concentration in the sciences and their implications for mathematicians, physicists, chemists, biologists, geologists, and oceanographers. (Illustrated)

The Ocean Systems Story
Work in underwater exploration under the Ocean Systems Program of General Electric's Re-entry and Environmental Systems Division, Philadelphia, Pa., receives attention in this booklet. Equipment and technology developed for the U.S. man-in-the-sea program are featured. (Illustrated)

Bottom Fix
General Electric's work toward making manned occupation of the ocean bottom possible is described in this pamphlet. This is another program of the Re-entry and Environmental Systems Division. (Illustrated)

Sea Robin
General Electric's buoy/satellite communications program, conducted by the company's Missile and Space Division, Philadelphia, Pa., is the subject of this pamphlet. (Illustrated)

FILMS

A variety of 16mm sound films are available without charge from Canadian General Electric. Subjects dealt with include: computers, mathematics, guidance, science, outer space, environment, lighting, rapid transit, marine subjects, training (business and technical), power generation and transmission. A complete listing of titles with particulars and information for ordering is available on request from:
Canadian General Electric
Company Ltd.,
Audio Visual Services,
214 King Street West,
Toronto.

The following, chosen at random from the Canadian General Electric film catalog, are representative of the films available:

You and the Computer —
9 minutes (color)
Live action and animation combine to provide a simple explanation of the operation of the computer. Suitable for use in secondary school, college, and industrial training.

Careers in Engineering —
14½ minutes (color)
An overview of the various fields of engineering showing their interrelationships and the personal qualities that seem most likely to ensure success in an engineering career.

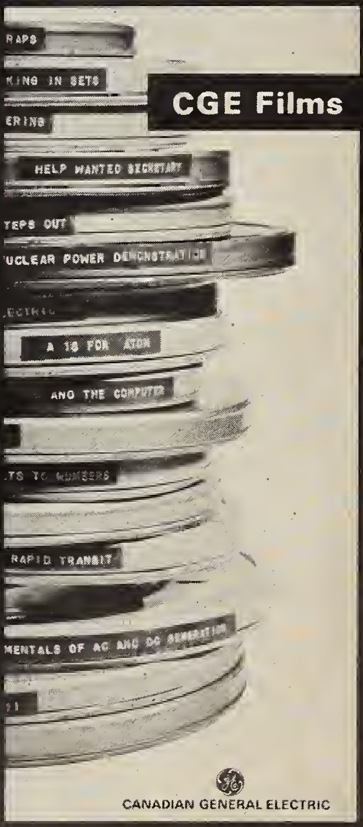
Principles of Electricity —
20 minutes (color)
Experiments and animation are used to explain electrical principles. Suitable for audiences from junior high school to adults.

Pipeline to the Clouds —
25 minutes (color)
How the 'cosmic' water cycle — from sea to clouds to earth and back to sea — controls the world's water supply. The film shows the means that protect our supply of pure water.

The Eye of the Beholder —
30 minutes (black-and-white)
No two people see the same thing in the same way; we tend to see in others qualities that are really part of ourselves. Problems of perception and projection receive attention in this film, which stresses the importance of self-awareness and the need for caution in judging others. An effective stimulant to group discussion of two-way communication and personal judgments.

Chemical Booby Traps —
10 minutes (color)
Proper care and knowledge minimize potential dangers in the lab. A film focusing on the hazards — including less obvious ones — that exist in all laboratories and showing how to live with them safely.

The Great River —
29 minutes (color)
The story of the St. Lawrence Seaway and Power Project. Its history, as well as its actual construction, is reviewed.



Profile of a School/ 13

Woodlands School

Woodlands School is the only one of its kind in Ontario specifically designed for integrating years 7 to 13. It is situated in the Erindale Woodlands area of Mississauga, about fifteen miles from downtown Toronto, and was opened two years ago to year 7 and 8 students. There are now three levels, and year by year another level will be added. As yet, part of the school is still under construction, but the building will be completed this summer — with facilities for academic, commercial, and technical studies. At present there are about seven hundred students; ultimately there will be over twice that number.

According to Don Lawson, the school's principal, the chief advantages of the grade 7-13 system are that it eliminates the confusing changeover from one school to another, allows for the school program to be integrated over two more years, and helps to do away with the traditional schism between primary and secondary school teachers. 'I am not one to lay great stress on innovation,' says Mr. Lawson, 'but I believe our system provides for more educational opportunities and less stress of change.'

In the lower grades of the school, the students are associated with particular form masters (with whom they take about half of their lessons), so providing them with a secure and continuing base. In year 7, the students have a set program of subjects, but they are allowed more and more options as they progress through the school. Promotion is on a subject basis. A block timetabling arrangement combined with individual timetabling allows classes either to operate as independent units or to join together in larger units — as the teachers wish — for study of the same subject. Contributing to this kind of flexibility is the school's architectural structure, which makes extensive use of portable partitioning.

Across the car park, a new K-6 school will be opened in 1972, and it is expected that the two schools will operate together in close harmony. Certainly this type of forerunner of a K-13 integrated system will be watched with interest by Canadian educators.